AVIATION WEEK

A McGRAW-HILL PUBLICATION

MAY 8, 1950

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All over the world, L-M runway lights are bringing pilots in to safe landings —in all kinds of weather. For L-M lights more runways than do all other high intensity systems combined. L-M's complete line of runway lights fits all airports—from the smallest to the largest. *For complete information ask the L-M Field Engineer or Airport Lighting Division, Line Material Company, East Stroudsburg, Pennsylvania. (Line Material is a McGraw Electric Company division.)*

Above, left to right: L-M's famous extreme high intensity unit—180,000 cp with controllable beam, CAA-approved, L-818; new fixed focus bi-directional high intensity unit, CAA-approved, L-819. Medium intensity unit for secondary runways, taxiways, and smaller airports, CAA-approved, L-802.

LINE MATERIAL...Airport Lighting

LM

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J-34 TURBOJETS

power the Lockheed XF-90 penetration fighter

The tactical sweeps assigned to this Air Force fighter take it far behind enemy lines. Such missions demand the maximum in fuel economy, performance and reliability of the aircraft's power plant.

To meet these requirements, Lockheed selected Westinghouse J-34 Turbojets. Their small frontal area and light weight . . . characteristic of Westinghouse axial-flow design . . . make possible high performance fighters like the XF-90.

J-34000

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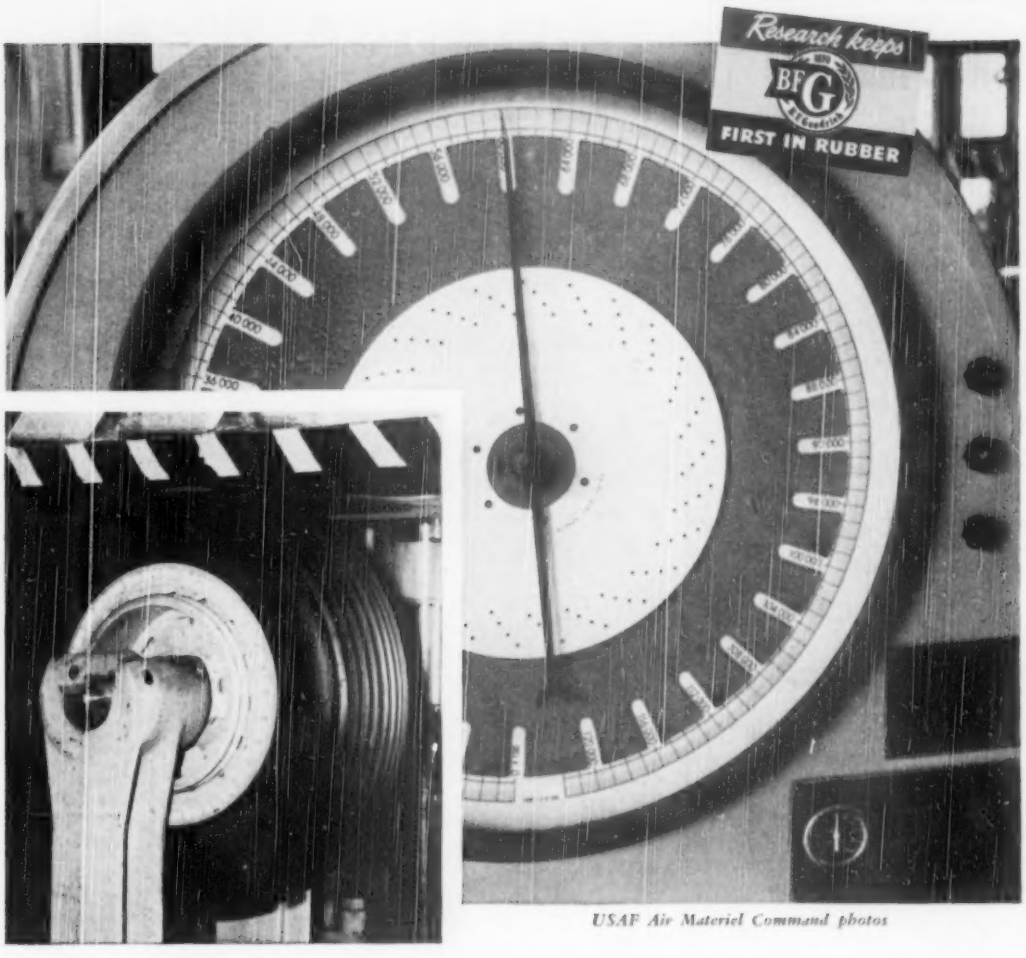
AVIATION GAS TURBINES



USAF Air Materiel Command photos

New B. F. Goodrich wheel carries record load of 60,000 pounds!

THE AIR FORCE needed a new wheel for North American's B-45 – a 56 x 16 wheel with the unheard-of load rating of 60,000 pounds! That's about 13,000 pounds more than the strongest wheel made could carry.

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You can see the results for yourself in the USAF photos above. The dial on the static load tester reads 60,000 pounds. Inset is the new B. F. Goodrich wheel that is taking this tremendous load. This wheel—with the greatest load rating of any airplane wheel in current production—has even stood up under test loads of 300,000 pounds! It has passed test after test with flying colors.

Used on North American's B-45 (Boeing's B-47 too), the new B. F. Goodrich wheel is equipped with the new BFG spider-type brake and BFG Type VII tires.

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Aviation Week

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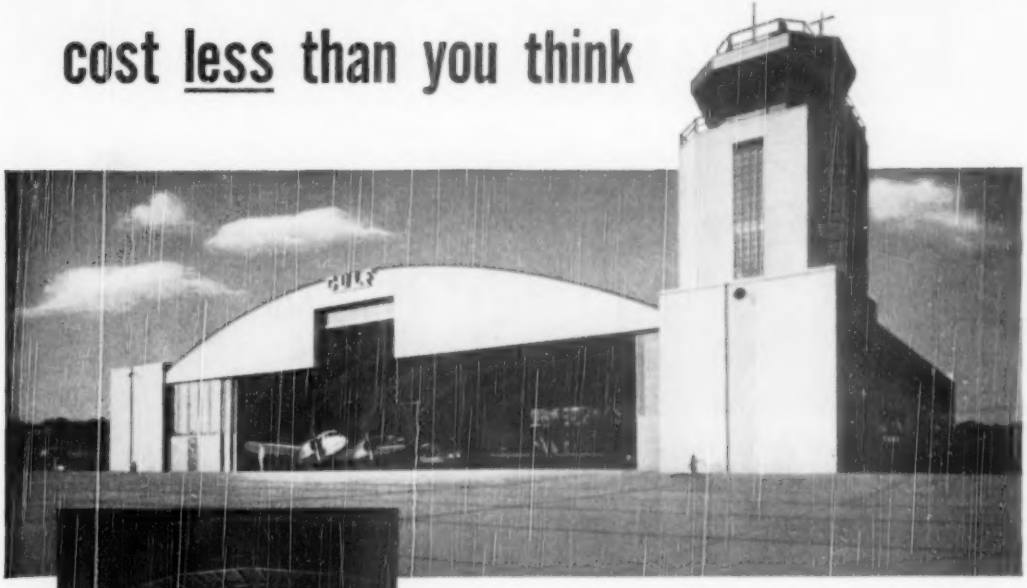

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FOR THE AVIATION INDUSTRY

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

WHO'S WHERE

In the Front Office

Roger Lewis has been appointed director of sales of Curtiss-Wright Corp., a newly created position. He comes to C-W from Canadair Ltd., where he was vp-sales. Lewis has been in aviation since 1934, and his first position was with Lockheed where he aided in building up that company's world-wide sales organization.

Dan B. Hains has been named vp-general manager of newly formed Strux division of Aircraft Specialties Co., Hicksville, N. Y. The new division will produce Strux cellular cellulose acetate-expanded plastic made in an extrusion process under license agreement with E. I. du Pont de Nemours & Co. Named as production manager of the new division is **Henry F. Weinkam.**

Arthur C. Smith, former cargo traffic manager for Western Air Lines, has been promoted to new position of director of sales administration for the airline, and **M. E. Sullivan**, formerly manager of rates and tariffs, has been named director of traffic. Under this realignment of WAL's sales department to provide a straight-line administrative set up and delegate more authority to field personnel, Smith and Sullivan will report directly to vp-sales. Reporting to director of sales administration will be **Arthur L. Hewitt**, manager of agencies and interline activities. **Mrs. T. B. MacDuff** has been promoted to manager of administrative procedures.

Merle W. Hemphill has been appointed deputy director of the Civil Aeronautics Authority office of airports. He joined CAA in 1946, coming from aviation division of Navy's Bureau of Yards and Docks.

Walther H. Feldmann has been named vp in charge of sales for Worthington Pump & Machinery Corp.; **John J. Summersby** is new vp in charge of purchases; **Frederic W. Thomas** has become general manager of purchases; and **Carleton Reynell** has been named general rep., sales and purchasing departments.

Honors and Elections

R. E. Gillmor, vp of Sperry Corp. will head the transportation and public utilities group in the Greater New York Fund's 1950 campaign. . . Pan American Airways executive vp **Samuel Pryor** has received the rank of Knight Commander of the Order of St. Sylvester from Pope Pius XII. . . **Major G. P. Bulman**, CBE., OBE, FRAS has been elected president of the Royal Aeronautical Society for 1950-51. . . **Elbert E. Husted**, president of Titeflex, Inc., has been made president of the board of Newark (N. J.) chamber of commerce.

► **Lear Elections**—**Russell A. Stevenson**, **John W. Dregge** and **Dean C. Smith** have been elected new directors, and **Harold R. Boyer** and **William A. Lear** have been re-elected to the board.

► **Robinson Elections**—New board of directors for the coming year consists of **C. S. Robinson**, president; **D. H. Robinson**, vp-treasurer; and **Robert S. Binkerd. G. deFreest Larner** was named to newly created post of board chairman.

INDUSTRY OBSERVER

► **Martin three-jet XB-51 ground support bomber has added a new bullet-shaped fairing at the top of its T-tail to smooth out airflow over the tail. With the sweep over the tail surface it gives the illusion to the pilot that a tiny airplane is flying escort just above and behind him.**

► Fairey Aviation of Canada has started tests at Amherst, Nova Scotia, of first Canadian-built Fairey Firefly, developed as a Canadian Navy trainer. Firefly is expected to replace U. S.-built Grumman Avengers on the Canadian carrier Magnificent.

► **Seibel Helicopter Co., Wichita, received certification from CAA on its model S-4 helicopter** (AVIATION WEEK Apr 24) **and plans to produce 30 production S-4s within the next year.**

► Reynolds Metals engineers expect it will be at least 18 months to two years before much of their new extruded ribbed sheet (AVIATION WEEK Apr. 24) shows up in airframes, since it will take time to redesign equipment for its use. A 15,000-ton capacity extrusion press to produce sheet 5 ft. wide would cost an estimated $6 to $10 million.

► **Continental Motors will sponsor a midget plane race at Willow Run Airport for the Third International Air Fair of the Aero Club of Michigan, Aug. 11, 12 and 13. It will be a forerunner to the as yet unsponsored midget races at the National Air Races, Cleveland, Labor Day weekend. Prize scale will be comparable to last year, though no sponsor is found.**

► New television transmission antenna developed by Glenn L. Martin Co. for its Stratovision project—broadcasting from airplanes at high altitude for longer range—would mount on a rotatable hub on tip of aircraft's tail, behind empennage. Idea is to get antenna mast away from engines, propellers and structural interference. For landing, mast is turned from vertical operating position to horizontal attitude paralleling stabilizer. The little-publicized project has obvious military application to guided missiles. Work, under USAF sponsorship, has been quietly continuing since 1945. Earlier antenna installation was a boom protruding from transmitting plane's belly.

► **Second Douglas C-124A cargo transport is scheduled for delivery May 10. Production will be stepped up at Long Beach until September peak of four planes a month is reached.**

► Assault transport competition was to begin at Wright Field this week between Northrop C-125A Raider tri-motor plane and the Chase YC-122C. Both planes have 8000-lb. payload. Chase is powered with two Wright 1820-101 engines while Northrop's entry has three Wright 1820-99 engines.

► **USAF sources predict a limited production contract for the Chase XC-123 out of $97.5 million 1950 fiscal funds nominally designated for miscellaneous and ground handling equipment. The big assault transport is now nearing end of Phase II tests and will be taken over by AMC for special evaluation tests late in May.**

► Stabilizing device developed by Minneapolis Honeywell for the Boeing B-47 Stratojet bomber, is being incorporated by Northrop in the YRB-49A jet Flying Wing due to fly within a week or two. Plane has four Allison J-35 jet engines installed in a bank at trailing edge, plus two additional J-35 jets attached in pods below wing. It is designed as a fully operational photo-reconnaissance plane, with better performance in speed and useful load expected than for the eight-jet YB-49 which burned in a ground taxiing accident at Edwards AFB, Muroc, Calif.

► **Final report of the chief air umpire for the entire Operation Portrex is expected to show the following performance for the F-84, Republic Aviation Corp. says: F-84Ds of the 20th Fighter Group lost in the air, 28; victories in the air, 82; lost on the ground, 48; destroyed by the 20th on the ground, 79. The "D-Day" simulated attack on Vieques Island resulted in the "loss" of 90 F-84s and "loss" of nine defending F9Fs, in the opinion of an official umpire attached to a Marine squadron (AVIATION WEEK Apr. 24). But this was only one engagement and the overall results, plus special factors always considered in war games, tipped the final score in favor of the F-84s, according to Republic.**

The New

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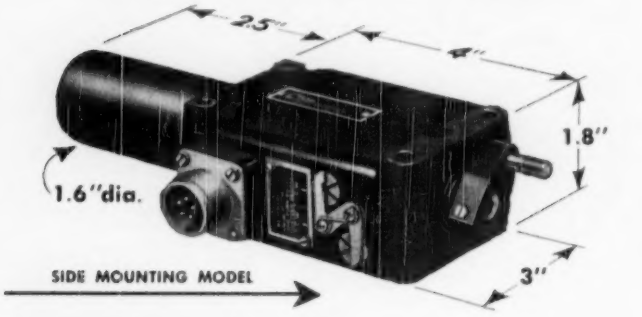
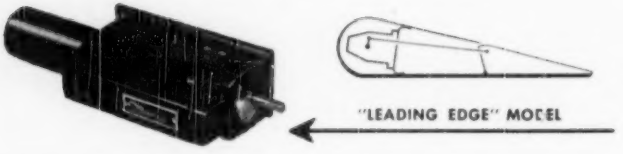


SIDE MOUNTING MODEL



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★ Two Mounting Styles. Side mounting model for general purpose and "Leading Edge" mounting model for Trim-Tab applications. See above.

★ Compact Size. Dimensions above.

★ Weight 2.25 pounds.

★ Static Capacity 1500 in. lbs. min.

★ Operating Load Capacity 350 in. lbs. (Standard Ratio)

★ Zero Backlash Output Shaft.

★ Positive Overtravel Safety Stops.

★ Radio Noise Filter Built In.

★ Compliance with all applicable specifications.

★ POSITIONING CONTROL or electrical synchronizing available using our "Servosyn" unit.

POSITIONING SERVOSYN CONTROL

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AVIATION CALENDAR

May 9—International Air Transport Assn. traffic conferences begin. Palace Hotel, Madrid, Spain.

May 9-20—Fourth annual technical conference of the International Air Transport Assn., Berkeley-Carteret Hotel, Asbury Park, N. J.

May 12-13—Midwestern conference on fluid dynamics and meeting of American Physical Society (fluid dynamics div.) in conjunction with dedication of new mechanical engineering building, University of Illinois, Urbana.

May 18-19—Annual meeting and third national forum of Corporation Aircraft Owners Assn., Hotel Statler, Washington, D. C.

May 18-20—Annual Meeting of Women's National Aeronautical Assn., Tulsa, Okla.

May 19-20—Seventh annual personal aircraft meeting, sponsored by Institute of Aeronautical sciences, Lassen Hotel, Wichita, Kans.

May 22-25—9th annual conference of the Society of Aeronautical Weight Engineers, Hotel Miramar, Santa Monica, Calif.

May 23—National meeting of AIA airplane Technical Committee, Carlton Hotel, Washington, D. C.

May 24-26—Technical conference on telemetering, sponsored by American Institute of Electrical Engineers and National Telemetering Forum, Benjamin Franklin Hotel, Philadelphia, Penn.

May 25-26—Aircraft Industries Assn. board of governors meeting, Williamsburg, Va.

May 25-27—Spring meeting, Society for Experimental Stress Analysis, Hotel Statler, Cleveland.

May 27—Annual spring air regatta, Philadelphia Aviation Club, Wings Field, Ambler, Penn. (May 28 is alternate date in event of bad weather.)

May 27-30—Wright Memorial Glider Meet, South Dayton Airport, Dayton.

May 30—Beginning of fourth session of the Assembly of the International Civil Aviation Organization, and the 6th session of the ICAO legal committee, Montreal, Canada.

June 1-4—Aviation Writers Assn. annual convention, Hotel Mount Royal, Montreal, Canada.

June 10-13—National Aeronautics Assn., annual convention, Hotel Statler, St. Louis, Mo.

June 10-25—International aero exhibition, Centenary Palace, Brussels, Belgium.

July 7-8—Royal Air Force 1950 display, Farnborough airfield, England.

Sept. 5-10—Eleventh flying display and exhibition, Society of British Aircraft Constructors, Farnborough airfield, England.

Oct. 16-20—1950 annual general meeting of the International Air Transport Assn., Fairmont Hotel, San Francisco.

PICTURE CREDITS

14—Martin; 15—NAL; 16—(upper) Boeing, (lower) Boeing; 21—(lower) CAA; 24—Walter Kidde & Co.; 41—(upper) Boeing, (lower) Boeing; 42—Boeing; 46—UAL.

NEWS DIGEST

DOMESTIC

Sweptwing XF-96A, new version of Republic Aviation Corp.'s F-84, completed taxi tests at the company's Farmingdale, N. Y., plant and last week was enroute to Edwards AFB, Calif., for flight tests. In addition to sweptback wings and tail, XF-96A has a 5300-lb. Allison J-35-25 engine to give it performance exceeding that of the F-84E. There is provision for additional internal fuel capacity and added external armament. XF-96A's 25,000-lb. gross weight is about 3000 lb. greater than that of the F-84.

Frank N. Piasecki, founder and president of Piasecki Helicopter Corp., was moved up by the stockholders to new post as board chairman. C. Hart Miller, who some months ago went from Glenn L. Martin to be vice-president and general manager of Piasecki, was elected president of the company. Piasecki remains in charge of research and development. Largest stockholder in the company is Laurence Rockefeller.

Transportation tax of 15 percent would be cut to 10 percent under a House Ways and Means Committee recommendation. The 3 percent tax on freight transportation would be cut to 1¼ percent.

Fairchild Engine & Airplane Corp. stockholders reelected by overwhelming vote the board of directors which a year ago replaced the former management. Stockholders also approved reimbursement of $127,556 to Sherman M. Fairchild and Luther M. W. Bolton for expenses as leaders of the stockholders in last year's fight. Chief items of expense: $44,000, legal; $38,000, printing, clerical, postage, etc.; $30,000, proxy solicitation; $10,000, miscellaneous; $5,000, public relations.

Lightplane altitude record of 24,504 ft. was established by ANA Luisa Branger, cultural attache of the Venezuelan Embassy in Washington, at Congressional Airport, Rockville, Md. She flew a Piper Cub Special, powered with a Continental C-90-8F engine. Previous record in same category was 18,999 ft., set by a French woman in 1949.

Nion Tucker, a leader in the series of mergers which resulted in United Air Lines, died in San Francisco. He was 64 years old.

FINANCIAL

North American Aviation, Inc. reports unaudited net income of $3,259,000, after taxes, for six months ending Mar. 31 on gross of $68,186,874. Mar. 31 backlog: $283,958,395.

Beech Aircraft Corp. voted a 20-cent quarterly dividend payable May 22 to stockholders of record May 8. Sales for the six months ending Mar. 31 were $6,972,500, and profit, $230,963. Backlog was about $12 million.

Lockheed Aircraft Corp.'s first-quarter operations were more profitable than the similar period of 1949, President Robert Ross told the annual stockholders' meeting. Backlog of $215 million includes $55 million for commercial business, with the remainder split about evenly between Air Force and Navy.

Air Associates, Inc. reports net profit for quarter ending Mar. 31 of $11,958, after taxes, and net profit of $13,951 after taxes for the six-months period ending Mar. 31. Sales for the quarter and six-months periods were $1,364,340 and $2,784,912 respectively.

Boeing Airplane Co. reports net earnings after taxes of $1,381,527 for first-quarter ending Mar. 31, with sales and other income of $60,282,005. Backlog on Mar. 31 was $366,236,830, compared with $365,804,690 on Dec. 31, 1949. Orders received during the period totaled $60,608,994.

Eastern Air Lines reports $1,569,999 net income for first-quarter 1950, compared with $1,298,065 in the same period last year.

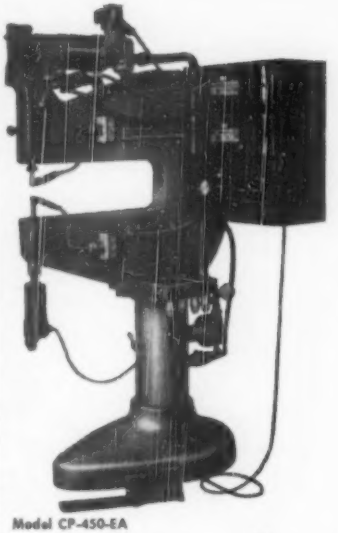
Chicago & Southern Air Lines reports $72,715 net loss for first-quarter 1950, compared with $36,021 net profit in same period last year. Losses on domestic operations were $28,365 below first-quarter 1949, but the deficit on international links was $16,856, compared with a $120,247 profit last year.

Sixteen Domestic Trunklines report $2,875,000 operating loss for February, compared with a $3,045,000 loss in same month last year. Industry's deficit also was below 1949 levels in January.

INTERNATIONAL

De Havilland Comet flew load equal to 34 passengers and luggage from London to Cairo in 5 hr., 10 min. Average speed for the 2183-mile flight was 425 mph.

Nearly 50,000 passengers were flown across the Atlantic by scheduled airlines in the first-quarter of 1950, a 25 percent increase over the comparable 1949 figure, according to the International Air Transport Assn. But while U. S. carriers were increasing their business by 15 percent, foreign-flag airlines added more than 50 percent. A year ago, the foreign-flag lines were carrying 29.3 percent of the total traffic. This year, they took 35.4 percent.



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In dimpling magnesium and the harder aluminum alloys, the application of heat is recommended to eliminate cracked dimples.

Developed for this type of work, the new CP Hot Dimpler incorporates Zephyr coin edge dimpling punches and dies which insure accurate nesting of dimples. Write for detailed information on the new CP-450-EA hot dimpler.

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Ram Jets get a 'Flight Engineer'

▶ A ***human*** flight engineer would have to shrink to the size of a gremlin to operate a ram jet. He would have to withstand temperatures from −100E to +700E... pressures from that at 100 feet under water to that at 80,000 feet in the air. On top of that... calculate and react in less than a second to complex mathematical problems.

▶ Yet the ram jet needs a flight engineer... and gets one in Wright Aeronautical's new ***power control system.*** It performs ***automatically*** the functions of a flight engineer on a modern airliner.

▶ Actually it does a great deal more, for in ram jet operation, where supersonic speeds prevail, much wider ranges of air flow, temperatures and pressures are encountered than in any previous-type aircraft. The power control checks instantaneous changes in air density, determines the jet's fuel requirements, and actuates the missile's controls in a fraction of a second. Result... smooth, highly efficient engine performance.

▶ These power control units—and all other ram jet components—are now under development in Wright Aeronautical's new ram jet laboratory. Here is another indication of this company's leadership in supersonic ram jet research and development.

Wright Aeronautical Corporation, Wood-Ridge, New Jersey

CURTISS WRIGHT

Vol. 52, No. 19

AVIATION WEEK

May 8, 1950

These Sums Were Asked . . .

	In 1951 Budget	In Truman Message	For Total of	Compared to 1950 Appropriation
For USAF	$1365 million	$200 million	$1565 million	$1250 million
For Navy	633 million	100 million	733 million	540 million

To Buy This Many Planes . . .

For USAF	1383	77	1460	1250
For Navy	817	100	917	798

$300 Million More Slated for Aircraft

President, Congress seen in agreement; USAF, $200 million, Navy, $100 million.

The Truman Administration decided last week to back a $300-million boost in Air Force and Naval procurement funds. It thereby sought to stave off a $583-million air power increase by Congress in the 1951 budget. Passage of the raise is fairly certain, now that it has the Presidential blessing.

In an official message, the President requested:

• **A $200-million increase** in the 1951 fiscal year budget in contract authorization for USAF procurement. With the $1365 million provided in the budget, this would make $1565 million available over the coming year for new plane obligations, compared with the $1250 million being obligated this year.

• **A $100-million increase** in the $633 million recommended in the budget for Naval aircraft procurement. This would make $733 million available over the coming year for new obligations, compared with the $540 million for this year.

USAF-funds boost is geared to sustain a striking force of 48 modern groups. Air Force now has 44 modern groups and five obsolescent groups. Increase would provide for the acquisition of 77 additional craft, for a total of 1460. This compares with USAF's procurement of 1250 planes this year.

▶ **Stop-Gap For Navy**—The Naval procurement boost amounts to only a partial stop-gap move to minimize deterioration of the Navy's combat air arm. It would allow acquisition of 100 planes in addition to the 817 provided for in the budget. The 917-plane procurement level for the coming year would compare with 798 for this year. Chairman Carl Vinson, House Armed Services Committee, has reported the Navy would have to procure 2166 planes in the coming year to sustain its current striking force of 6233 modern combat craft.

▶ **Pressure Change**—The President's recommendations came after heavy outside pressure.

Gen. Dwight Eisenhower, in an appearance before the Senate Appropriations Committee, had urged additional procurement funds to prevent a weakening in USAF's 48-group strength. Vinson had proposed a $583-million increase—$200 million for USAF and $383 million for the Navy—to the budget. The Joint Chiefs of Staff, unofficially, endorsed the Vinson proposal. It was virtually on the eve of House acceptance of the Vinson amendment (AVIATION WEEK May 1), that the President urged the scaled-down increase.

Sequence of developments:

• **Vinson scheduled** the four chiefs of staff to appear before a public session of his committee. With Russia shooting down U. S. planes, he said, Congress could hardly reject a proposal which the Joint Chiefs of Staff approved as essential to the defense.

• **Louis Johnson**, Secretary of Defense, much criticized for sacrificing defense, capitulated. He brought to the House Appropriations Committee his proposal for a $300-million increase in aircraft procurement funds the day before the scheduled appearance of the Joint Chiefs before the Armed Services Committee.

• **House Appropriations Committee** promptly approved the Johnson recommendation. "We have always been ready to support air power," Rep. George Mahon (D., Tex.), chairman of the Committee's armed services subcommittee commented, "but this year we saw no point in recommending funds which would not be used. We did that last year."

• **Vinson cancelled** the now unnecessary session with the Joint Chiefs and announced that he would also support the Johnson proposal and abandon plans

More Billions

Tentative estimates for the 1952 fiscal year defense budget are between $3 and $6 billion above the $14.5 billion 1951 fiscal year budget. Most of the increase is for the strategic air arm. The boost is predicated on the integrated defense program of the 12 North Atlantic pact nations. North Atlantic Council, top policy group, meeting in London on May 15, will review and pass on the integrated program worked out by defense ministers last month at The Hague. Secretary of State Dean Acheson will represent the U. S. The U. S.'s primary role under the integrated plan is strategic bombing.

for a bigger boost for Naval aircraft procurement. "It takes care of the Air Force and will ease the situation with the Navy satisfactorily for the time being," he commented.

• **President's official** request for additional funds, required "in the light of changing world conditions" was submitted the following day.

▶ **Vinson Victory**—This was a victory for Vinson and his staunch air-power advocates in Congress. Even if they had succeeded in maneuvering the $583-million proposal through Congress, the funds, without Administration approval, would be subject to impounding. That's what happened to the $800 million for USAF procurement to support a 70-group program voted for this year.

The House is expected to complete action on the 1951 fiscal year omnibus government appropriation bill—of which the defense budget is a part—by the end of this week. Senate action may be stalled for a considerable time because of the impending fight over civil rights legislation.

Meanwhile, Adm. Forrest Sherman, testifying on the proposed new $335-million "atomic age" submarine program before the House Armed Services Committee, hinted that the Navy may decide to push construction of the controversial 65,000-ton flush-deck carrier, United States. Several members of the committee protested cancellation of its construction by Johnson. In a recent report the committee said that it "deplores the manner of cancellation . . . but, because of the pressure of other shipbuilding programs at the present time and the existing budgetary limitation . . . will withhold further action—for the present—as regards construction of the vessel."

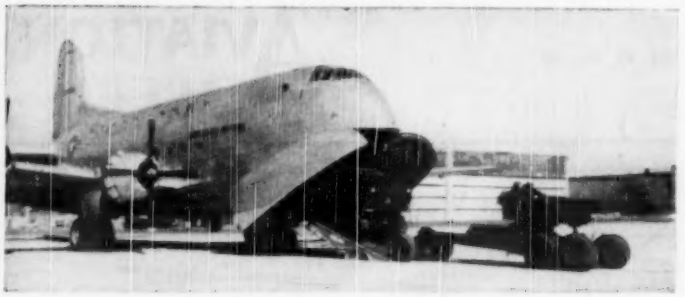
Airframe Shipments

Shipments of complete aircraft, measured in airframe weight, was 3,225,000 lb. in Feb. 1950, according to the Bureau of Census and the Civil Aeronautics Administration. U. S. military customers took 88 percent of the airframe weight.

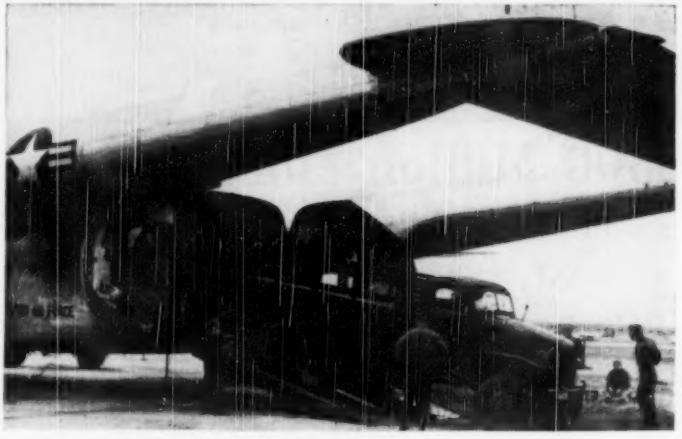
Civil aircraft shipped during the month amounted to 225 planes valued at $7.9 million, compared with January shipments of 167 planes, worth $12.1 million. Report covers 34 complete aircraft plants operating 39 factories, and 13 engine companies operating 14 plants.

Aircraft engines shipped in February totaled 4,036,900 hp., with the military accounting for 97 percent of this power.

Employment in plane plants for February was 162,741; 163,531 were employed in January. Employment in engine factories was 39,562, compared with 39,837 for the previous month.



C-124, demonstrated at Swarmer, swallows a tractor and 8-in. gun totaling 52,420 lb.



C-119 Packet, larger, more powerful version of the C-82, loads an Army truck.

'Swarmer' Shows Airlift Weakness

Improvement needed in air-transportable equipment, unloading methods, fighter cover, traffic control.

Camp Mackall, N. C.—Serious deficiencies in strategic airlift preparedness became apparent here last week as Exercise Swarmer ended. Observers saw evidence of a lack of effective procurement coordination between USAF and Army planners where air transport needs are concerned.

As a result of those deficiencies, witnesses of the combined airlift and ground support maneuver (AVIATION WEEK May 1) expect service evaluation teams to call for:

• **New USAF emphasis** on steps to save precious time now squandered in inefficient ground handling.

• **New Army emphasis** on combat equipment—tanks, trucks and artillery—that can be carried with greater speed and efficiency by air.

▶ **Design Shortcomings**—Part of the ground time problem can be laid to design shortcomings of available planes. Part can be blamed on the makeshift ground handling equipment now used in the field—when any equipment is available.

The question of making combat equipment more easily airborne, observers feel, calls for increased attention by ground-force procurement officials to designs that will lessen bulk and use lighter metals.

▶ **Critique to Come**—While the official critique of Exercise Swarmer will be several weeks in compilation, five vital gaps in the technique of establishing and maintaining an airhead showed up in the maneuver:

• **The Army is ground-bound** by the gross weight of its equipment. For example the Douglas C-124A (now in production but not used operationally during Swarmer), would be restricted to movement of one 49,000-lb. medium tank per plane.

Use of such aircraft, moreover, would be restricted to improved air strips, since these planes currently require a 5300-ft. runway to clear a 50-ft. obstacle.

AIR INVASION is simulated at Exercise Swarmer by Paratroops sown from Packets.

• **High jet fighter cover** seriously tested by the USAF for the first time, bogged down both in its escort function and protection of staging areas for transport craft.

At crucial points during establishment and early operation of the aerial "pipeline," this latest USAF technique of high altitude fighter support (necessary because of high jet fuel consumption) fell short of expectations.

Aggressor forces continually sneaked through the complex defense net to attack both rear staging areas and the forward airhead landing area.

• **First-line and production transports** were found deficient at staging areas and in particular at the airhead landing strip, where landing time would be a critical factor.

Under "ideal" staging area conditions, where U. S. Forces claim "absolute air superiority," the following load and unload time factors were shown:

	Load Time	Unload Time
C-74	1:45	:45
C-54	:55	:35
C-46	:40	:30
C-119	:45	:30
C-82	:35	:25

Actually, Army equipment was loaded aboard transport aircraft by crudely designed makeshift methods rigged by Army engineers. Under actual wartime stress this equipment might have collapsed. Rapid loading of C-54 transports was accomplished by a wooden elevator operated by hydraulic lift-dump trucks conveniently at hand.

USAF had no "conventional" loading equipment available.

• **Lack of coordination** between troop carrier squadrons of USAF and Army airborne units was apparent.

Men and materiel in para drops were scattered to an extent that could have spelled disaster in an enemy-dominated land area.

• **Air traffic control** of troop and cargo transports moving in to consolidate the airhead was ineffective. Planes converged on the landing strip more rapidly than "in-the-field" traffic control could handle them.

Plane commanders were at a loss as to where to place their craft for unloading and were inadequately briefed on emergency procedure for leaving the airhead after discharging cargo.

▶ **Look Ahead**—Whatever the immediate conclusions to be gained from the maneuver, the consensus was that among long-range considerations, one realistic factor stands out.

This is the need for funds for new equipment if there is to be closer coordination of Air Force and Army procurement in solution of strategic airlift problems.

The Army still uses much World War II equipment, little of it designed with air-transportability in mind. The main volume of air transport planes now available for immediate use are C-54s.

▶ **Cooperation**—Army planners appear fully cognizant that in a future conflict their service would depend on close cooperation and support by both USAF and Navy. So they are all out for joint operations, plans and evaluation of equipment with an eye to Army needs.

But there persists a feeling that USAF and Navy pay only lip service to Army problems.

Air Force overall plans call for strategic needs to take precedence over any Army air support requirements. There are few people, however, more familiar with the deficiencies of present airlift equipment than the Air Force officers assigned to airlift planning.

▶ **Prototype Hesitation**—There is an important reason behind Air Force hesitancy to go all out in support of a government-sponsored advanced transport-prototype program.

The reason is the firm conviction of rank and file AF engineers that a combination civil and military transport plane is like most combination aircraft—not completely satisfactory for either use.

Past experiences, mostly with passenger transports converted for cargo use, presumably are at the root of their reluctance.

Prototype Proposal Gets Lease on Life

The double stimulus of continued British advances in jet transport development, and military warnings of a major deficiency in U. S. airlift capacity sparked a new drive in Congress last week for government development and mass procurement of cargo and transport planes.

Sens. Edwin Johnson and Owen Brewster jointly introduced two bills authorizing:

• **A $12.5-million** appropriation to finance a five-year testing program on new transport prototypes, "particularly turbine-powered aircraft, aircraft especially adapted to the economical transportation of cargo and aircraft suitable for feederline operation." This program would be administered by Civil Aeronautics Administration. The bill was the outcome of joint efforts by Air Coordinating Committee, civil and mili-

tary aviation agencies and has the endorsement of the Budget Bureau and the two senators.

• **A $100-million** Aircraft Development Corp. to buy existing type cargo and transport planes for leasing to airlines and others certified by Civil Aeronautics Board. The ADC authorized to spend $10 million annually for research and development of new types. This bill was not endorsed by the two senators. The Budget Bureau and Department of Defense have previously opposed similar previous bills. Air Transport Assn. contends it would create an excessive airfleet, not justified by existing or potential traffic, and inject "too much government" into the industry.

▶ **ATA View**—"It would be a major step toward government ownership of the airlines," ATA's general counsel, Stuart Tipton commented. "If a tremendous airfleet were built up, the civilian economy would rely just as much on this as it does on the current airfleet and be just as much disrupted by its conscription on D-Day by the military. Furthermore, railroads, trucks, and buses are not going to consent to a wholesale capture of their traffic by a government-subsidized airfleet."

▶ **Senators Comment**—Johnson and Brewster commented favorably on the testing program.

"It is only a first step toward prototype legislation," Brewster said. "But it seems to be the only program on which general agreement can be reached. I am in favor of pushing it at this time, and leaving a broader program to the future."

Johnson said: "It is all right as far as it goes, but it doesn't go far enough. I want provision made for the development of a good feeder plane to replace the DC-3, which the government could buy and rent out to the feeder lines. It would go a long way toward solving their financial problem and reliance on government mail subsidies. I am not worried about the trunk lines. They will fare out on their own. But I do think something should also be done to lessen the military airlift deficiency. This is 1000 times more important than developing a fast long-range jet transport type for commercial operations."

▶ **Hearings Planned**—Johnson, as chairman of the Senate Interstate and Foreign Commerce Committee, announced that hearings would open in the "immediate future" on the two bills presented last week, and on several other bills designed to promote cargo and transport plane development pending before the committee. These include:

• **Two versions** of the Brewster-Hinshaw proposal, from the 1948 recommendations of the Congressional Aviation Policy Board. These would set up a board, composed of representatives of USAF, Navy, CAA, National Advisory Committee for Aeronautics, and Civil Aeronautics Board, which, under the direction of the Secretary for Air, would survey requirements and finance prototype developments. ATA is four-square behind the measures. AIA's membership never reached agreement. Individual manufacturers, notably Glenn L. Martin Co. and Consolidated Vultee fought them. They anticipated that the prospect of cheap new types, on which the government had offset development costs, would cause airlines to drop purchases of 2-0-2s and Convairs.

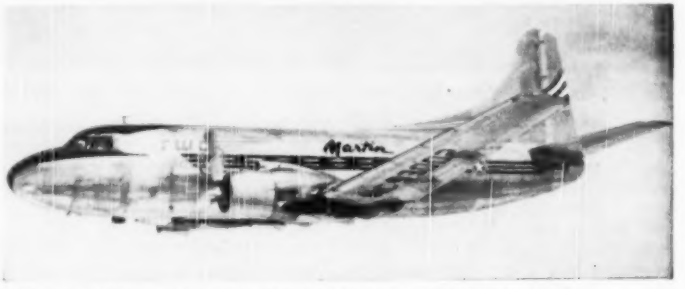
• **An earlier version** of the Aircraft Development Corp. bill, also introduced by Johnson. Instead of setting up an independent corporation, this version would place it under the Secretary for Air.

• **Creation** of a National Civil Aviation Council, composed of the CAA Administrator, the Chief of the Army Field Forces, and NACA's Chairman, to administer a prototype program for private planes. This legislation was introduced by Johnson at the request of the National Association of State Aviation Officials.

▶ **Only Chance**—The $12.5-million testing program is the only proposal given a serious chance for Congressional approval at this session. But even it will have to buck the opposition of Sen. John Williams (R., Del.), a member of the Senate Commerce committee. "It looks to me like a wedge to open the federal treasury to wholesale subsidization of the airlines, indirectly by financing equipment costs," Williams stated. (In 1948, Williams successfully blocked Senate approval of the House-approved Brewster-Hinshaw bill.)

Meanwhile, Military Air Transport Service's commander, Maj. Gen. Laurence Kuter, called on Congress to take definite action at this session either to enact a bill or definitely to reject the proposition of government assistance for commercial plane development. Uncertainty that has prevailed over the past three years, Kuter said, was hampering progress, discouraging airlines from purchasing and manufacturers from moving forward on their own.

Kuter said: "The manufacturing industry and the operators have not invested their own funds . . . while the provision of federal funds has been under consideration. As long as federal funds are in the offing, I believe that it is unnatural to expect any single American manufacturer to risk his private funds on projects."



GUINEA PIG—Martin's 2-0-2 test plane will be transformed into the first 4-0-4.

Martin Shaping 4-0-4 Sales Effort

Long-range plan developing: first, certification of 2-0-2 successor and deliveries next spring; then, a turboprop.

By Alexander McSurely

Baltimore—Glenn L. Martin Co. intends to have a turboprop-powered 4-0-4 to sell when that type of powerplant is proven for airline use and the airlines are ready to use it. That time looks to be three to five years away. But long before then—probably in the middle of next year—Martin will have a turboprop 4-0-4 flying experimentally.

"Meanwhile," Martin President C. C. Pearson told AVIATION WEEK in an exclusive interview, "the piston-engine 4-0-4 airline business to the $35-million ready to satisfy more immediate passenger transport needs."

▶ **Sales Campaign**—Eager to add more 4-0-4 airline business to the $35 million order already received from Eastern Air Lines and Trans World Airline, the Martin company is preparing an intensive sales effort to get it. Potential customers are such companies as United, Braniff, Chicago & Southern, Colonial, Delta, National and North-

west. Of these, only Northwest, using Martin 2-0-2s—unpressurized sister ships to the new pressurized 4-0-4s—has any postwar twin-engine transport equipment.

"Now that we have the big basic 65-plane order," Pearson continued, "we can handle additional plane orders, even small ones, on an attractive price basis that we could not have touched otherwise."

▶ **Turboliner**—Out at San Diego, Consolidated Vultee Aircraft Corp., Martin's closest rival in the twin-engine transport field, is putting Allison T-38 turboprop engines, rated at 2750 equivalent shaft hp. into a cargo version Convair-Liner, purchased by General Motors Corp. It will serve as a flying test bed for the Allison engines and new design three-blade Aeroproducts propellers. Originally scheduled for first flight in June, the Turboliner, as Convair has called it, probably will not get into the air until July.

But the Martin company is counting on Allison's pledge to make the engineering data concerning the first American turboprop transport installation available promptly to any other interested manufacturer.

▶ **Other Tests**—The Martin schedule calls for preparation of a 4-0-4 or its equivalent for turboprop installation and flight test as soon as two other more pressing flight test programs are completed.

The first of the testing programs is to get the Martin 2-0-2 certificated at a new gross weight of 42,750 lb. as compared to the original CAA-approval figure of 39,000 lb. The other is to get CAA certification for the 4-0-4. The 2-0-2 test ship owned by the company will get a 39-in. insert to lengthen her fuselage to 4-0-4 proportions, and other modifications to make her conform to the 4-0-4 specification. Then she takes the air again to get CAA certification for the 4-0-4.

Shortly after the delivery of the first of the certificated 4-0-4s next spring, the tempo of development of the turboprop 4-0-4 is to be stepped up.

▶ **3500 Hp.**—Changes except for nacelle modifications are expected to be minor in the turboprop installation, since the 4-0-4 is designed from the beginning to take the greater stresses of higher turboprop powers. (Allison T-38 is expected to be developed to as high as 3500 equivalent shaft hp. by the time it is acceptable for airline use, from three to five years after the first flight date of the Turboliner.)

Another major step in the 4-0-4 program was taken last week when contracts for pressurization of the 4-0-4 was let to AiResearch after a competition which involved the Fairchild Stratos system, and Hamilton Standard division of United Aircraft, making its first bid for pressurization business.

▶ **AiResearch System**—A complete AiResearch system for each plane will weigh approximately 160 lb. Compressor will operate off the right engine of the plane, with a two-speed drive for ground cooling at low speed (1000 engine rpm.) and at normal cruising rpm. A planetary system is designed to maintain constant compressor-rpm. regardless of engine-rpm. Design is to a specification for maintaining relatively constant cabin pressure, even while plane is on the ground and left engine is stopped to permit loading and unloading of passengers.

Cabin supercharger will couple directly to engine accessory pad, weighs 52 lb. and supplies 80 lb. compressed air per min. Backward-curved impeller blades are based on a new AiResearch development. Turbine refrigeration unit, cabin pressure and electric controls are similar to other cabin pressurization equipment developed by AiResearch.

▶ **Pre-set Controls**—Automatic cabin altitude and temperature control is provided to over 20,000-ft. altitude. Sea level conditions will be maintained up to 7000 ft. and a safe, comfortable differential between cabin pressure and outside pressure will be maintained up to the maximum operating altitude. Pilot will be able to pre-set cabin altitude and rate of change while plane is on the ground so system will automatically follow the pre-set plan in flight. Completion of the AiResearch deliveries is scheduled within 1951.

The AiResearch system was selected after a combined engineering conference between Martin, Eastern and TWA on competing systems.

▶ **Final Assembly**—While engineering department of Martin is working at high speed finallizing design details and engineering drawings of the 4-0-4 for production, the 12 2-0-2s which are to be leased to TWA, are in a final assembly line in the factory being assembled.

These will be licensed at the 42,750-lb. gross weight. Roll-out schedule calls for the first to leave the plant in finished state June 15, with delivery after flight test presumably early in July.

▶ **Three Spliced**—When leasing arrangements were completed with TWA, Martin had three fuselages mated and a fourth fuselage ready to have its fore and aft sections joined. The rest of the airplanes were in sub-assemblies, ready to move on down the line.

Inspection of the 2-0-2 line last week showed it was moving rapidly, with

ALL-WEATHER F-95A INTERCEPTOR

First flight photo of North American F-95A all-weather interceptor shows family lines of the North American F-86 Sabre from which it was developed. F-95A originally was designated as F-86D (AVIATION WEEK Jan. 2). Designed for high altitude short range intereceptions, F-95A is powered with a GE J-47 jet engine rated at 5200-lb. thrust with an afterburner arrangement which boosts power approximately 50 per-cent more for short bursts of speed. Fuselage is 41 ft. long, and wingspan is 39 ft. Note radar cone at nose, and air inlet duct below it. Its up-to-date design insures maximum speed for short range interceptions.

every indication that the first of the 12 would be rolled out on schedule and that the last of the 12 would also be ready by its September-due date.

▶**More Tanks**—Among modifications which are being made on the planes from their original specifications, are inclusion of 2 additional outboard Mareng-cell fuel tanks in the wing of each plane in addition to the four two-celled Mareng tanks which were original equipment. The galley will be moved back about four feet from its original position, but will still remain forward of the passenger cabin.

TWA will use a color combination of two shades of green and a cream color in the passenger cabin. The rear integrally built loading ramp will be used, much as it is in the Northwest 2-0-2s. It is now provided with a bumper arrangement to cushion shock of lowering. Forward and aft luggage compartments will be included. Passengers can carry their own baggage on board and leave it in the aft compartment, or their luggage can be stowed in the forward compartment.

Leasing arrangement for the 2-0-2s is a temporary arrangement for the airline, until it can get the 4-0-4 equipment next year. But after TWA turns them back, Martin expects to be in a position either to re-lease the planes, or to sell them to some other airline. Meanwhile, TWA plans to retire its old Boeing Stratoliners, the first pressurized four-engine transports operated in this country, and use the 2-0-2s as replacements.

AGCA Evaluation Tests Authorized

Air Navigation Development Board has authorized the Air Force to conduct a complete evaluation test of the Automatic GCA system (AVIATION WEEK Apr. 3) at Wright-Patterson AFB, Ohio as soon as the All-weather Flying Center is relocated there. (All-weather center is in process of moving from its former location at Wilmington AFB.)

The new testing program for the new radar experimental landing approach system—designed to handle six landing airplanes simultaneously—will include checking the operation with Shoran and with theodolites, and testing it alongside other systems. It follows an earlier demonstration of the system for ANDB at Los Angeles Ontario Airport, after which the board observers concluded that tracking circuits of the system needed additional development.

The board has designated Richard N. Close, Airborne Instruments Laboratory, consultant to make independent appraisal of AGCA and to make recommendations for improvements of the tracking circuits.

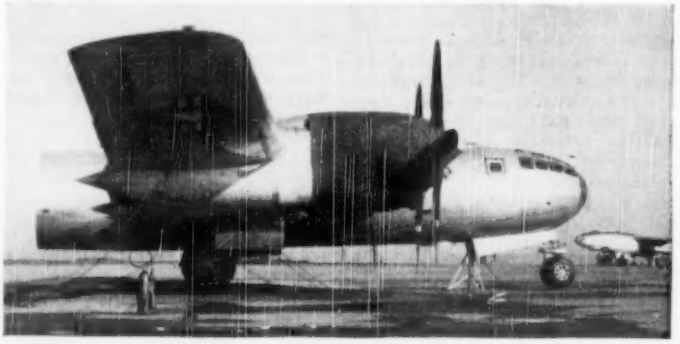
ANDB conclusions on the basis of the first demonstrations, subject to possible revision in the light of the additional forthcoming tests, are that the system will still require a minimum of two years development, that it will then take approximately two years to get appropriations for procurement of production quantities and probably another year to eighteen months to get delivery of the equipment.

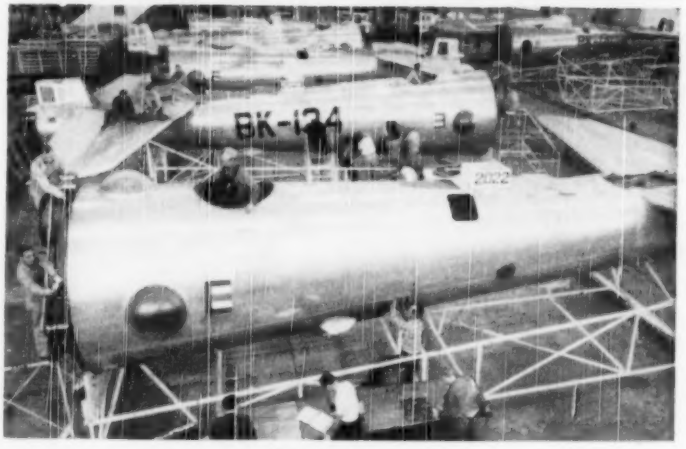
However Gilfillan Brothers, Inc., manufacturers of AGCA, (developed from their earlier successful Ground Control Approach radar, which is part of present landing approach systems) have discussed with the board a tentative offer to make the equipment available in quantity within six months. Gilfillan would provide airborne part of the system in a compact "box" weighing only 6 lb. Experimental airborne control is not much larger than a shoebox and weighs 7 lb.

Basically the system uses an autopilot control in the plane, which is actuated by signals transmitted from a ground AGCA installation, without human aid.

ANDB regards the AGCA as a likely solution for the ultimate phase of the nation's all-weather flying instrument program, but considers it less advanced than the manufacturer contends, an ANDB spokesman told AVIATION WEEK. The board does not wish to repeat the difficulties which resulted when the omnirange system was put into operation too early, before all the "bugs" were removed.

Board does not consider that the present AGCA situation is "reviving" the old GCA-ILS controversy, since GCA in its approved commercial form is accepted along with ILS as a part of the present system, along with ILS, omnirange and distance measuring equipment radar.





BEFORE AND AFT

Sawing the body in half is a trick Boeing Wichita's engineers adapted to speed the modification of Seattle-built Boeing B-50 bombers into RB-50B photographic and reconnaissance planes. Since the modification work was confined to the rear part of the planes, where the photographic equipment was to be installed, fore and aft sections were separated, making it possible to move more work into the plant. This speeded project, despite extra tasks of "breaking" and remating the two sections.

PRODUCTION

Air Force Bid Information

Air Materiel Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCFPSX72.

ABSTRACTS

For stand assemblies (50-883):
Gadgets, Inc., Dayton, on a bid of $10,-995.30.

For embossing machines (50-913):
Companies sharing: Pannier Corp., Pittsburgh, on a bid of $13,629, and Roovers Brothers, Inc., Brooklyn, on a bid of $7,844.94.

For power cable (50-917):
Companies sharing: Manhattan Lighting Equipment Co., New York, on a bid of $51,284.95; Westinghouse Electric Supply Co., Dayton, on a bid of $6457.05; Okonite Co., Chicago, on a bid of $15,152, and Belden Manufacturing Co., Chicago, on a bid of $1078.

For photographic chemicals (50-951):
Companies sharing: Eastman Kodak Co., Rochester, on a bid of $758.10; Atkinson Laboratory, Hollywood, on a bid of $243.60; Octagon Process Inc., Brooklyn, on a bid of $535.48; Standard Products Co., Philadelphia, on a bid of $342.75; Kosmins Camera Exchange, Philadelphia, on a bid of $1929.70, and G. Gennert Inc., Brooklyn, on a bid of $148.56.

For aircraft tanks, (50-1001):
Airquipment Co., Burbank, on a bid of $18,681.67.

For pitot airspeed tube (50-1031):
Aero Instrument, Cleveland, on a bid of $5514.60.

For gloves (50-1074):
Companies sharing: Miller Products Co. Inc., New York, on a bid of $3184.20, and Anchor Rubber Co., Dayton, on a bid of $574.08.

For vapor type degreasers (50-674):
G. S. Blakeslee & Co., Chicago, on a bid of $84,322.56.

For services and materials (50-849):
Standard Electrical Products Co., Dayton, on a bid of $3712.80.

For indicators (50-873):
Companies sharing: Brown Instrument div. Minneapolis-Honeywell Regulator Co., Dayton, on a bid of $300, and Wilson Mechanical Instrument Co., Inc., American Chain & Cable Co., Inc., New York, on a bid of $2796.

For wood jointers (50-875):
Companies sharing: Delta Manufacturing div., Rockwell Mfg. Co., Milwaukee, on a bid of $21,656, and Newman Machine Co., Inc., Greensboro, N. C., on a bid of $20,-887.50.

For aluminum tape (50-895):
Aluminum Co. of America, Washington, D. C., on a bid of $6785.

For grinders (50-956):
Lempco Products, Inc., Bedford, O., on a bid of $14,720.

For rubber parachute suspensive line retaining bands (50-958):
Miller Products Co., Inc. New York, on a bid of $3290.38.

For ballast, connectors, guard assembly (50-975):
Companies sharing: Gaffney-Kroese Elec. Supply Corp., New York, on a bid of $1221.20; Manhattan Lighting Equip. Co., Inc., New York, on a bid of $1572.90; Graybar Electric Co. Inc., Dayton, on a bid of $1130.80; Audio Electric Co., Chicago, on a bid of $1108.80; Whele Electric Co., Buffalo, on a bid of $1032; L. B. Electric Supply Co., Brooklyn, on a bid of $2456, and Raytron Corp., Guttenberg, N. J., on a bid of $975.

For testing machines (50-1075):
Independent Engineering Co., Inc., O'Fallon, Ill., on a bid of $3586.

For ball bearings (50-1009):
Fafnir Bearing Co., New Britain, Conn., on a bid of $8000.

For reflector assembly (50-829):
Companies sharing: Gedro, Inc., Stamford, Conn., on a bid of $24,756, and Standard Electrical Products Co., Dayton, on a bid of $3158.

For steel carbon drill rod (50-901):
Companies sharing: Edgar T. Ward Sons Co., Dayton, on a bid of $1629.06, and Jessop Steel Co., Washington, Pa., on a bid of $2621.55.

For brake-sheet; shear-squaring (50-931):
Companies sharing: Barth Manufacturing Co., Millidale, Conn., on a bid of $5082, and Peck, Stow & Wilcox Co., Southington, Conn., on a bid of $6850.

For thermometers (50-1061):
Rochester Manufacturing Co., Inc., Rochester, on a bid of $10,275.

For dope (50-910):
Companies sharing: Monsanto Chemical Co. (Merrimac div.), Boston, on a bid of $15,108; Rockford Paint Mfg. Co., Rockford, Ill., on a bid of $2617.92; William Armstrong Smith Co., East Point, Ga., on a bid of $2976; Apex Color Works, Inc., Jersey City, on a bid of $1670; Titanine, Inc., Wichita, on a bid of $1784.16, and John R. MacGregor Lead Co., Chicago, on a bid of $824.50.

For steel angle structural (50-765):
Companies sharing: Central Steel & Wire Co., Chicago, on a bid of $604.80, and Carnegie Illinois Steel Corp., Cincinnati, on a bid of $6990.

AF Invitations to Bid

Bid openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who write local field office, stating bid invitation number.

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

INVITATIONS

Gasket rings; packing Rings, 1-12 items, bid invitation No. 50-1469, issue date 17 April, delivery within 120 days.

Aircraft screws, 1-37 items, bid invitation No. 50-1468, issue date 17 April, delivery 50% within 60 days, complete within 120 days.

Adapter kit, 1-8 items, bid invitation No. 50-1460, issue date 17 April, delivery 1st Article within 90 days, complete within 90 days after approval of 1st Article.

Drafting equipment, 1-31 items, bid invitation No. 50-1471, issue date 17 April, delivery complete within 60 days.

Junction box, 150 each, bid invitation No. 50-1459, issue date 17 April, delivery within 90 days.

Aircraft accessories, 1-16 items, bid invitation No. 50-1475, issue date 17 April, delivery by July 1950.

Steel storage cabinet; office table, 1-2 items, bid invitation No. 50-1474, issue date 17 April, delivery within 75 days.

Stand assembly, 1-2 items, bid invitation No. 50-1461, issue date 17 April, delivery starting within 30 days and complete within 90 days.

Ground servicing equipment, 1-11 items, bid invitation No. 50-1476, issue date 17 April, delivery starting within 60 days, complete within 30 days after.

Utility trailer, 1-6 items, bid invitation No. 50-1477, issue date 17 April, delivery starting within 60 days, complete within 8 months thereafter.

Lamp assembly, 1-5 items, bid invitation No. 50-1478, issue date 17 April, delivery within 30 days.

Electric lantern, 500 each, bid invitation No. 50-1479, issue date 17 April delivery within 30 days.

Lamp assembly, 1223 each, bid invitation No. 50-1480, issue date 17 April, delivery within 45 days.

Aerial navigation beacon tower, 20 each, bid invitation No. 50-1482, issue date 18 April, delivery beginning within 30 days, complete within 60 days.

Clothing racks; desk trays, 1-2 items, bid invitation No. 50-1483, issue date 18 April, delivery within 60 days.

Transformers, 8000 each, bid invitation No. 50-1485, issue date 18 April, delivery starting within 150 days.

Runway relays, 100 each, bid invitation No. 50-1487, issue date 18 April, delivery complete by 31 August 1950.

Manometer, 1-4 items, bid invitation No. 50-1488, issue date 18 April, delivery within 60 days.

Aircraft bolts, 1-25 items, bid invitation No. 50-1489, issue date 18 April, delivery starting within 45 days, complete within 90 days thereafter.

Timers, 50 each, bid invitation No. 50-1490, issue date 18 April, delivery within 60 days.

Alternators, 1-8 items, bid invitation No. 50-1492, issue date 18 April, delivery 100 units per month starting in August 1950.

Aircraft generators, 1-8 items, bid invitation No. 50-1493, issue date 18 April, delivery 60 per month starting in January 1951.

Inverters, 1-8 items, bid invitation No. 50-1494, issue date 18 April, delivery 100 per month starting in August 1950.

Steel, 1-9 items, bid invitation No. 50-1502, issue date 18 April, delivery starting within 30 days, complete within 150 days.

Manometer, 1-2 items, bid invitation No. 50-1507, issue date 18 April, delivery start 60 days, complete within 120 days thereafter.

Fitting assembly, 1-3 items, bid invitation No. 50-1495, issue date 18 April, delivery starting within 60 days, complete 120 days thereafter.

Fixture assemblies, 10 each, bid invitation No. 50-1505, issue date 18 April, delivery starting within 60 days, complete within 60 days thereafter.

Clips; screws, 1-5 items, bid invitation No. 50-1501, issue date 18 April, delivery starting within 60 days, complete within 120 days.

Pump assembly, 1-4 items, bid invitation No. 50-1504, issue date 18 April, delivery start within 60 days, complete within 120 days.

Tow target, 5000 each, bid invitation No. 50-1515, issue date 18 April, delivery complete in September 1950.

Extension cords, 1-9 items, bid invitation No. 50-1513, issue date 18 April, delivery within 30 days.

Communications equipment components, 1-6 items, bid invitation No. 50-1506, issue date 18 April, delivery within 90 days.

Waste receptacle, 15,000 each, bid invitation No. 50-1516, issue date 18 April, delivery within 75 days.

Office equipment, 1-4 items, bid invitation No. 50-1517, issue date 18 April, delivery within 75 days.

Clothing, 1-10 items, bid invitation No.

50-1491, issue date 18 April, delivery beginning within 90 days and complete within 60 days thereafter.

Fitting assembly, 1-8 items, bid invitation No. 50-1512, issue date 18 April, delivery start within 30 days, complete within 120 days.

Test set, 1-6 items, bid invitation No. 50-1498, issue date 18 April, delivery within 180 days.

Trainers, 1-20 items, bid invitation No. 50-1520, issue date 19 April, delivery by July 1950.

Aircraft hardware, 1-11 items, bid invitation No. 50-1519, issue date 19 April, delivery start within 60 days, complete within 120 days.

Aircraft hardware, 1-9 items, bid invitation No. 50-1514, issue date 18 April, delivery 30% within 30 days, complete within 120 days.

Aircraft hardware, 1-15 items, bid invitation No. 50-1518, issue date 19 April, delivery start within 30 days, complete within 120 days.

Training aid equipment components, 1-11 items, bid invitation No. 50-1500, issue date 20 April, delivery 6 months from receipt of contract.

Filing bench machine, 1-2 items, bid invitation No. 50-1551, issue date 24 April, delivery starting within 60 days, complete within 90 days.

Phototube unit, 20 each, bid invitation No. 50-1558, issue date 24 April, delivery within 150 days.

Indicators assembly, 10 each, bid invitation No. 50-1540, issue date 24 April, delivery within 30 days.

Honing machine, 1-4 items, bid invitation No. 50-1553, issue date 24 April, delivery complete within 180 days.

Tester instrument case, 221 each, bid invitation No. 50-1563, issue date 24 April, delivery within 120 days.

Electrical equipment, 1-5 items, bid invitation No. 50-1541, issue date 24 April, delivery within 30 days.

Aircraft elbows, 1-12 items, bid invitation No. 50-1560, issue date 24 April, delivery start within 60 days, complete within 90 days.

Crystal blank, quartz, 1-3 items, bid invitation No. 50-1559, issue date 24 April, delivery samples within 45 days, no less than 20% of each item within 90 days after date of receipt of approval of samples, and no less than 40% of each item every 30 days thereafter until completed.

Adapter assembly, 3000 each, bid invitation No. 50-1545, issue date 24 April, delivery complete by September 1950.

Riveter machine, 4 each, bid invitation No. 50-1564, issue date 24 April, delivery start within 60 days, complete within 90 days.

Rivets, 1-49 items, bid invitation No. 50-1547, issue date 24 April, delivery 50% within 45 days, complete within 120 days.

Milling machines, 29 each, bid invitation No. 50-1554, issue date 24 April, delivery start within 45 days, complete within 120 days.

Metal costumer, 500 each, bid invitation No. 50-1548, issue date 24 April, delivery within 45 days.

Grinder-drill, 1-2 items, bid invitation No. 50-1550, issue date 24 April, delivery start within 45 days, complete within 90 days.

AF Awards

The following completes AVIATION WEEK's listing of February USAF contract awards of less than $100,000. Total number of contracts for the month was 580, value about $73 million (AVIATION WEEK April 24). Estimated completion dates are indicated.

Sprague Electric Co., North Adams, Mass., electrical noise suppressor, Mar., 1950, $2202.

Springfield Electric Motor Co., Inc., Springfield, Ohio, aircraft adapters, May, 1950, $3424.

Stainless Steel Products Co., St. Paul, developing tank, Mar., 1950, $5964.

Standard Electric Products Co., Dayton, resistors, May, 1950, $1444; miscellaneous insulators, May, 1950, $2480.

Standard Mfg. Co., Dallas, adapter assembly for engine transportation dolly, type K-1, July, 1950, $71,429.

Standard Pressed Steel Co., Jenkintown, Pa., aircraft bolts, May, 1950, $1480.

Standard Piezo Co., Carlisle, Pa., crystal units, Apr., 1950, $2243.

Standard Products Co., Philadelphia, photographic chemicals, Feb., 1950, $1955.

Standard Record Co., L. I. City, N. Y., cylinders for dictaphones, Mar., 1950, $1161.

Stanley Aviation Corp., Buffalo, aerial delivery droppable platforms, Oct., 1950, $95,880; parachute disconnect and controls, Oct., 1950, $16,110.

Sterling Siren Fire Alarm Co., Rochester, N. Y., spare parts for crash fire trucks, Mar., 1950, $7407.

Struthers-Dunn, Inc., Philadelphia, 70 each, general purpose, relay, Apr., 1950, $1954.

Sundstrand Machine Tool Co., Rockford, Ill., constant speed alternator drives 60 KVA, Aug., 1950, $50,393.

Syracuse University, Syracuse, N. Y., research and investigations on structural properties of alloys, Feb., 1951, $28,000.

Technical Service, Inc., Plymouth, Mich., photo dehumidifier kits, Apr., 1950, $1768.

Technicraft Corp., Kansas City, Mo., acid proof aprons, May, 1950, $16,836; aircraft covers, June, 1950, $45,661.

Thompson Products, Inc., Bell, Calif., aircraft bolts, Apr., 1950, $1425.

Timken Roller Bearing Co., Canton, Ohio, bearing assembly, Mar., 1950, $3478.

Titeflex, Inc., Newark, N. J., emergency procurement of ignition equipment spare parts, subassemblies and/or assemblies, June, 1950, $5000.

Torrington Mfg. Co., Torrington, Conn., outer bearing assembly, Apr., 1950, $4850.

Trane Co., La Crosse, Wisc., coils, June, 1950, $1520.

Trinity Oxygen Co., Ft. Worth, breathing oxygen, grade A, June, 1950, $8565.

United Aircraft Corp., E. Hartford, Conn., gust alleviation, Dec., 1950, $25,600.

United Aircraft Products, Dayton, maintenance data, May, 1950, $3485; oil cooler valves, July, 1950, $4856.

United Mfg. Co., div., United Advertising Corp., New Haven, Conn., bench, portable, small tool aircraft instrument repair, June, 1950, $5995; test stand, aircraft generator and maintenance handbooks, Mar., 1950, $22,685.

U. S. Electrical Tool Co., Cincinnati, buffer and polisher, pedestal type and maintenance data, June, 1950, $29,916.

U. S. Gage Corp. div., American Machine and Metals, Inc., Sellersville, Pa., fuel pressure gages, Oct., 1951, $8499; manifold pressure type gage, Apr., 1951, $35,603; manifold pressure gages, Nov., 1951, $5853.

U. S. Rubber Co., Detroit, aircraft tubes, May, 1951, $2178; aircraft casings, May, 1950, $3400.

U. S. Rubber Co., New York, maintenance parts for crash fire trucks, Sept., 1950, $42,200; gasoline hose, June, 1950, $10,250.

University of Chicago, Chicago, research on projective tests on temperament, June, 1950, $21,775.

University of Illinois, Urbana, infra-red research, Nov., 1950, $36,497.

University of Texas, Austin, psychological consultatory services to human resources research center at Lockland AFB, Mar., 1950, $2400.

Vapor Blast Mfg. Co., Milwaukee, machines, spark plug cleaning and blast finishing and cleaning, May, 1950, $36,630.

Waco Aircraft Co., Troy, Ohio, binder assembly and related parts, Apr., 1950, $1259.

Wagner, E. B., Mfg. Co., Milwaukee, hinges, May, 1950, (two contracts) $5670, $5220.

Wagner, Ferd, Co., Cincinnati, photographic spare parts, Apr., 1950, $10,612.

Wagner, Ferd, Co., Dayton, spare parts for photographic equipment, Apr., 1950, $1725.

Warner Aircraft Corp., Detroit, maintenance data, Apr., 1950, $7243.

Weatherhead Co., Cleveland, assembly fitting, May, 1950, $2150.

Welsh Mfg. Co., Providence, lens, shield and helmet, Mar., 1950, $1624.

Western Electric Co., New York, resistors, Mar., 1950, $1078.

Westinghouse Electric Corp., Dayton, modification of generators, June, 1950, $81,-840; add 5 60 KVA alternators and 5 40 KVA voltage regulators, Sept., 1950, $42,-333; repair 18 in. × 27 in. bearing for wind tunnel, Feb., 1950, $2044; crown and coil assemblies style 867818 and 867820, Mar., 1950, $1390.

Weston Electric Instrument Corp., Newark, N. J., ammeters, voltmeters, shunts, May, 1950, $1274; exposure meter, Mar., 1950, $3713.

Whipple and Co., New York, stamping machines, July, 1950, $40,347.

Wickes Engrg. and Constn. Co., Camden, N. J., components of control tower console, Sept., 1950, $9524.

Wollam Aircraft-Mar. Prod. Co., Celina, Ohio, instrument mounting clamp, May, 1950, $2438.

Wright Aeronautical Corp. div., Curtiss-Wright Corp., Wood-Ridge, N. J., sling assembly, Aug., 1950, $5260.

Yardley Industries, Columbus, kits leakage test oxygen mask and regulator, May, 1950, $13,838.

PRODUCTION BRIEFING

► **Beech Aircraft Corp.** has been awarded contract for complete manufacture and assembly of soft drink vending machines by Master Corp., Little Rock, Ark.

► **Chance Vought division** of United Aircraft Corp. will be closed for a general vacation period from July 23 to Aug. 6.

► **Consolidated Vultee Aircraft Corp.'s** San Diego division plans to add about 3000 employes to aid in conversion of B-36B into D model. Modification, in addition to other changes, includes installation of four J-47 jets to supplement six P&W Wasp Majors. "Inadequacy" of Ft. Worth plant for other than production of B-36B necessitated utilization of San Diego plant, USAF said.

► **Frederic Flader received** USAF contract for 60 guided-missile jet engines of 700-lb. thrust at 600 mph., weighing 300 lb. Contract amounts to $1,250,-000. Backlog is $2,500,000 and includes other military gas turbine projects termed "secret."

► **Lockheed Aircraft Service,** MacArthur Airport base, is doing 1000-hr. maintenance inspection on MATS Lockheed C-121B and equipping plane with radar navigational equipment and paddle props . . . This base performed 3,429,-482 work-hours of maintenance, overhaul and modification on 353 planes last year.

► **Pacific Airmotive Corp.** announces that it is the first private aircraft service company equipped to maintain, repair and service gas turbine engines.

► **Ryan Aeronautical Co.** has received approximately $\frac{1}{2}$ million worth of reorders for Boeing C-97A aft-fuselage sections, also for C-97A cargo doors and floor beams . . . Company also got $1-million increase in GE orders for J-47 parts.

ENDIX-SCINTILLA for a quarter of a century has devoted its resources and engineering skill to the progressive development of *all types* of Aircraft Ignition. Thus, the aviation industry has come to consider Bendix-Scintilla the one source *uniquely qualified* to design and produce ignition equipment to meet every operating requirement.

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*At Barajas Airport and throughout Spain, the marketer of Esso Aviation Products is Standard Oil Company of Spain, S.A.

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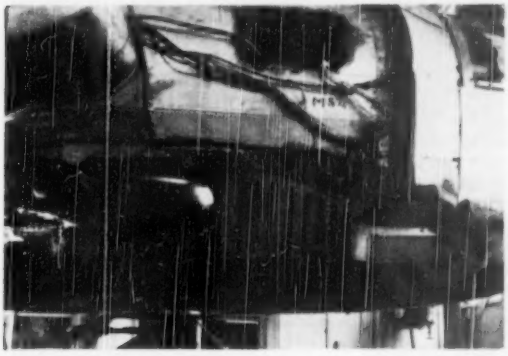
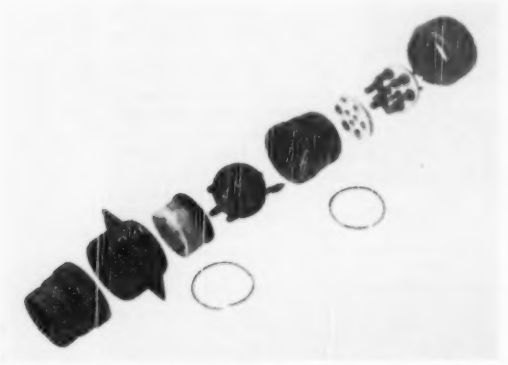
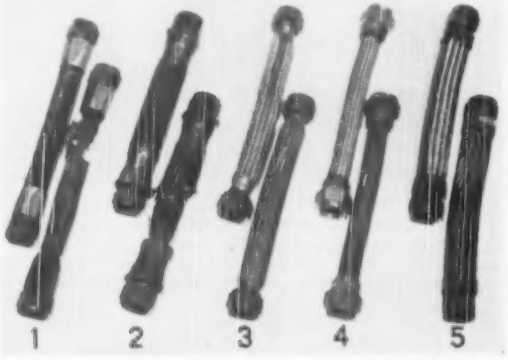


LOUVERED COWLPIECE with duct, used in study of exhaust stack well (left), showed that elimination of louvers and/or increasing air flow minimized fire hazard. Right: Heavy aluminum alloy longeron in engine support structure (upper right) failed within 20 sec. after large oil fire began. Engine would have been lost if not for two stainless steel emergency support cables. Damage to accessory section skin would indicate that fire in section could be put out only by carrying unreasonably large amount of extinguisher.





FIREPROOF CONNECTOR for bulkhead after fire test. Newly developed fitting, mainly stainless steel and transite, successfully withstood severe 2000-F. gasoline fire for 15 min. Right: Hose specimens before and after being subjected to internal fire, such as can occur in vacuum system, which can attain 1600-1800 F. temperature. Hose 1 withstood fire for approximately 1½ min.; hose 2, for about 5 min. Hoses 3 (stainless steel), 4 (Inconel), and 5 (stainless steel) withstood test fire for 10 hours without damage.

How You Can Cut Aircraft Fire Danger

By H. L. Hansberry*

The best method for preventing aircraft fires is to eliminate the flammable fluids involved. Work toward that end is being carried forward by many groups in both the industry and Government.

Considerable progress has been made in the development of safer hydraulic fluids. Some progress is being made in the development of safer engine lube oils. The mere fact that several people in the aircraft industry are looking askance at the extreme hazard inherent in the use of gasoline demonstrates a degree of progress even along that line.

Thus, we have some reason to be optimistic about any long range view of aircraft fire safety. However, we still must live with the planes of today and probably with several models we have not yet seen, but which will go into service before our long range projects are completed. Until that time, we should take whatever steps are possible to improve aircraft fire safety.

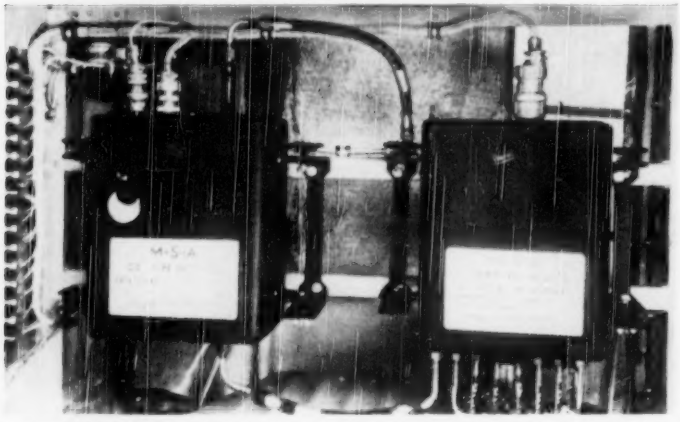
Many of these steps have been demonstrated in the Civil Aeronautics Administration fire test program being conducted at Indianapolis. They are outlined here as they apply to new aircraft, but many of them can be applied for improving existing aircraft as well.

Flight Fires

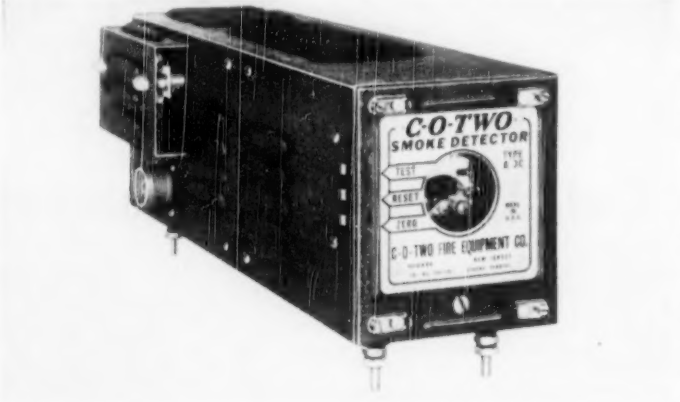
▶ **Powerplants**—As the aircraft powerplant is a major source of flight fire, it will be given first consideration.

* Powerplant Development Section, CAA Experimental Station, Indianapolis. This paper was presented under title of "Fire Out—By Design," at the recent 18th annual meeting of the Institute of the Aeronautical Sciences, in conjunction with the Flight Safety Foundation, in New York City.

VOLUME DETECTOR: "Fireye" detector is lead sulphide layer type photoelectric cell which sees flame within volume designated as fire zone. Unit is teamed with amplifier and station test switch. System discriminates against ambient light conditions by utilization of the light modulation characteristic of flames. Developed in lab of Photoswitch, Inc., device is marketed by Fireye Corp., Cambridge, Mass.



CO DETECTOR: Device detects fire by measuring carbon monoxide concentrations. Analyzer (left) determines amount of CO in air samples (from compartments) fed to it by multiple sampling valve (right). This valve admits air from the different locations individually at 30 sec. intervals to analyzer. When CO in sample exceeds specified concentration, signal circuit is energized. Maker is Mine Safety Appliance Co., Pittsburgh.



SMOKE DETECTOR: Unit operates on the principal of light reflection from smoke particles. Projection lamp directs light beam parallel to surface of photoelectric detecting cell. Cabinet's black interior reflects small amount of light to circuit-balancing photoelectric cell. When smoke enters cabinet, particles reflect light to detecting cell, which generates current to unbalance circuit, relay action lighting indicating lamp or sounding alarm. Device is available in two models, convection type (shown) and tube type. Maker is C-O-Two Fire Equipment Co., Newark, N. J.

Prevention:

- The engine exhaust system, one of the most serious fire ignition sources, should be located as high in the engine installation as possible. The tailpipe should be located above the wing.
- A second source of ignition, the electrical system, should be located as high as possible in the engine installation. Both the electrical and exhaust systems should be so located in order that leaking flammable fluids should travel away from the ignition sources rather than toward them.
- In order to complete this arrangement, the fuel, oil, and hydraulic systems should be as leakproof as possible and should be located as low in the installation as possible. Particular care should be given to properly locating the various tanks included in these systems.
- Sufficient drainage and ventilation should be provided, such that even large leaks can be rapidly drained away and no dangerous concentrations of flammable vapors can accumulate.
- Internal surfaces of the powerplant cowling should be as smooth and clean as the external surfaces to prevent accumulations of flammable liquids and vapors.
- The collecting, slowing down, and heating of air flows can be extremely dangerous when that air is combined with flammable vapors. Every effort should be made to insure that air to be so processed is free of those vapors.
- All air inlets are safest when located in the leading edge of the powerplant.
- All air outlets should be located as far aft as possible.
- All drains, vents, and air outlets should be piped to a common low-pressure area as far aft as possible on the airplane.
- In no instance should any discharge port for air, vent line or drain be located where the discharge can enter or impinge on any other part of the plane.
- The exhaust system should be separated from Zones 2 and 3 by a double steel shroud carrying a ventilating air flow. Joints in the shrouds should be so staggered that flows of fluids cannot possibly reach the exhaust system.
- Louvers should not be used for providing ventilation for the exhaust system, as they have been proved to be dangerous due to the turbulence created. Smooth flows of air over the exhaust system have proved safe even with flammable vapors present. Turbulent air, in combination with flammable vapor and hot metal, is a very dangerous condition.
- Consideration should be given to the use of cooled engine exhaust gases for inerting closed zones, such as 2 and 3. Reference is made here to the work done by Cornell Aeronautical Laboratory under contract to the Navy.

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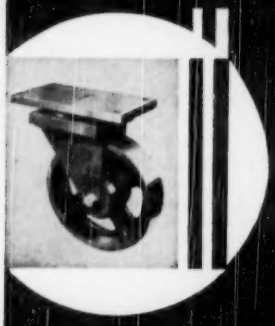
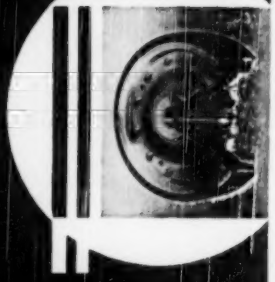
From low selling price to high resale value, you're money ahead with Chevrolet trucks. Chevrolet's rock-bottom initial cost—outstandingly low cost of operation and upkeep—and high trade-in value, all add up to the lowest price for you.

Darnell Casters





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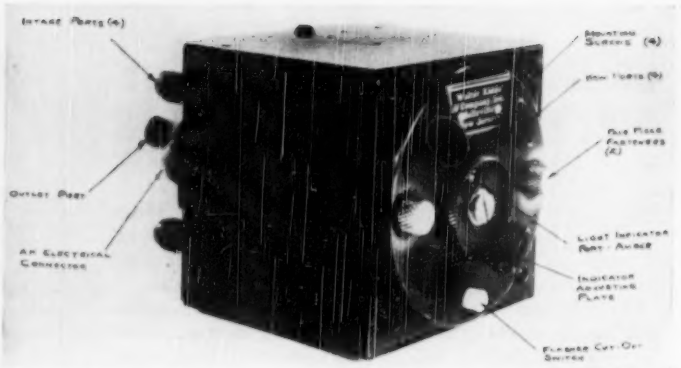

SMOKE DETECTOR: Visual type smoke detector is intended to permit inspection of air from four compartments. No light is visible through any of four view ports unless smoke is present in housing to reflect light. Flasher (can be cut off) gives more sensitivity and better warning. Intensity of indicator light reaching the cockpit is adjustable for pilot's convenience. Maker is Walter Kidde & Co., Belleville, N. J.

• All vacuum pumps should incorporate fusible plugs to prevent fire ignition within the vacuum system. The purpose of the plug is that of a fuse for emergency use only and not as a substitute for a poorly designed vacuum system. The outlet from the plug should be drained free of any other part of the airplane, as is true of the other flammable fluid drains.

Compartmentation:

• In order to confine fires to the smallest volume, all zones should be tightly bulkheaded from each other.

• Materials suitable for this purpose include stainless steel, Monel, Inconel, and titanium.

• It is essential that fireproof materials should be used in the basic structure of the powerplant and in the cowling and skin of the powerplant. Welded steel tube nacelle structures and engine supports have proved to be extremely fire-resistant.

The entire nacelle should be constructed of fireproof metals, as well as wing skin in vicinity of nacelle.

• Steel bulkhead fittings should be incorporated both in the tubing and electrical systems which pass through the bulkheads.

• Fire-resistant flexible joints between bulkheads and cowling vibrating at different frequencies should make use of Dow Corning Silicone X-1740 or equivalent.

• Fireproof metals should be used for all tubing systems, ducts carrying flows of air and/or flammable vapors, tank supports, straps, and brackets.

Flexible metal hoses have proved to be fireproof and should be used wherever practicable throughout the powerplant.

• Shutoff valves should be incorporated in all flammable fluid systems preferably at the firewall and/or at the tank outlets.

• Insulation should be provided to prevent the spread of heat through bulkheads, as well as the spread of flame.

• Hoses and electrical insulation should be non-flaming and non-smoldering.

• Great care must be given to the amount of ventilation and drainage provided. Too little of either can result in an explosive condition capable of destroying bulkheads or cowling.

• Explosion-proof electrical equipment should be used in any location which could possibly be subjected to flammable vapors.

• Individual pieces of hazardous equipment should be completely isolated by fireproof metals and properly vented and drained.

Detection:

• Two improved types of fire detecting equipment are the volume detector and the continuous detector, both of which are presently moving into the flight test stage. The volume detector can best be described as a photo-electric cell capable of detecting fire in a relatively large volume. The continuous detector is one which is capable of detecting heat applied anywhere along its length.

• Present unit type fire detectors must be used to best advantage at present. Such detectors should be closely spaced throughout the cooling air outlets from Zones 1, 2, and 3 and should be located at the top and along the sides of zones carrying little air flow, as well as in the vicinity of any obvious fire hazards.

• Supervisory systems should be incorporated, such that the fire detecting system can be completely checked in flight.

• Each powerplant installation should incorporate an individual fire detecting system. It is unnecessary to provide in-

dividual systems for each zone of any powerplant. It is suggested that detector operation should, in addition to warning the pilot, set all the necessary valving for the discharge of extinguishing agent to the proper powerplant.

Extinguishment:

- Carbon dioxide should be eliminated from use in aircraft powerplants.
- CB or preferably methyl bromide should be used in all power plants.
- The toxicity of the better fire extinguishing agents should be de-emphasized. Personnel should not be exposed to any extinguishing agent at any time and, so long as the problem is one of fire hazard, the best fire extinguishing agent should be used.
- All zones of aircraft powerplants should be protected by a properly designed extinguishing system, including Zone 1.
- Discharge of extinguishing agents to all zones in any powerplant should be simultaneous and for the same duration.
- The quality, rate, and duration of extinguishing agent discharge under all flight conditions should be carefully engineered.
- Engine shutdown and the stoppage of all flammable fluid flows is always required. Engine shutdown in itself can eliminate fire fuel and allow the fire to burn out.
- Fires in all zones can be extinguished with or without engine shutdown.
- The present practice of locating extinguishing agent containers within the fuselage is undesirable. The necessarily long feed lines make very difficult the provision of adequate agent discharge rates. Such a system spends much of its weight for plumbing rather than extinguishing agent, and it does not lend itself to good crash fire protection. It is suggested that in four-engined aircraft a two-shot system be located in each wing with the shortest possible lines to each engine in each wing or that a single-shot system be mounted within each nacelle with cross-feeds between the nacelles in each wing.

► **Baggage Compartments**—Recently, the possibility of baggage compartment fires has been very much emphasized. In this connection, the following steps should be taken in an effort to combat such fires.

Prevention:

- The baggage compartment should be sealed, such that the air flowing through the compartment represents a total of less than one-half volume change per hour.
- The baggage compartment should be isolated from all flammable fluid systems and the electrical system.
- Only legal and properly packed cargo should be carried.
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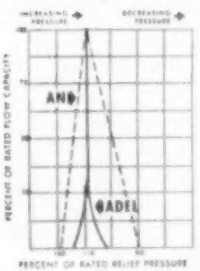

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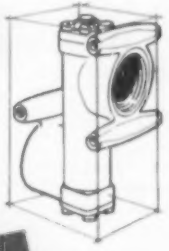

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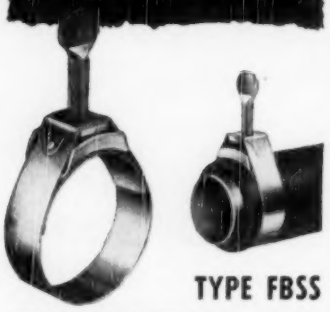

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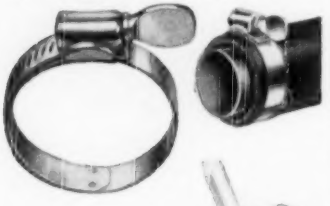

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to carry combustibles or flammable fluids in personal baggage.

• A suitcase should be stowed on its side rather than in an upright position. This removes the chimney effect produced by the joint of the two halves.

• Tests indicated that suitcases containing folded clothing is less susceptible to ignition than those containing rumpled clothing. Tightly packed suitcases are less prone to ignite than those only partially filled.

Compartmentation:

• The baggage compartment should be sealed, such that the air flowing through the compartment represents a total of less than half volume change hourly.

• Use fire-resistant materials, such as stainless steel, titanium, etc.

• Isolate the baggage compartment from all other volumes of the airplane.

Detection:

• Existing automatic smoke and CO detectors proved satisfactory, but tests indicated that reduction of the sensitivity settings of both instruments would reduce the occurrence of false alarms with little increase in the time required for operation. It is suggested that sensitivity setting of smoke detectors be on the order of 60 percent light transmission over one foot. It is suggested further that the automatic CO detectors be set to operate at 250 parts per million of CO.

• Visual detectors proved very reliable in the tests. Such detectors operate by the appearance of smoke in a light beam. While the visual detector is not capable of attracting attention, further tests have proved that a tube carrying air and smoke from the baggage compartment to the cockpit can readily attract the pilot by odor. A combination of the two devices should reduce false alarms to zero.

• Detecting systems generally should provide pickups in the air outlet of small compartments and in the air outlet and at quarter points in larger compartments.

Extinguishment:

• The baggage compartment should be sealed, such that the air flowing through the compartment represents a total of less than one-half volume change per hour.

• Oxygen starvation provided by a sealed compartment proved extremely reliable in both extinguishing and controlling baggage compartment fires.

• A large majority of baggage compartment fires are incapable of existing at altitudes at 18,000 ft. or over.

• Carbon dioxide applied at a ratio of one pound for every eight cubic feet of volume is a satisfactory extinguishing agent if the airflow results in a one-half volume air change per hour or less.

• Neither water nor wet water completely extinguished any of the baggage compartment fires tested, however, either of the liquids provided fair control time with relatively high air flows.

• With air changes greater than one-half volume per hour, no extinguishing agent is reliable. The agents tested included carbon dioxide, methyl bromide, methylene chlorobromide, carbon tetrachloride, water and water plus a wetting agent.

Crash Fires

Prevention:

• To prevent aircraft crash fires, it is necessary to consider the overall airplane design. An effort should be made to separate the fuel from the powerplants and both from the passengers and crew.

• It is unsafe for any flammable fluid tank to be mounted in line with any powerplant. The wing center section is also a dangerous tank location when considering crash fire hazards.

• A greater effort can be made to retain the fuel in the tanks by improved tank design. Tests at Indianapolis have indicated that the existing bladder cell arrangement is not greatly superior in crash resistance to the integral fuel tank. This is due to the fact that the bladders require further development toward increased elasticity and increased strength under deformation necessary in a crash. That development is now underway.

• Crash fires should be minimized by cutting off all electrical systems, engines, and flammable fluid systems at the time of impact and by discharging the engine fire extinguishing systems. The large quantities of extinguishing agent required to combat flight fires should, under the conditions of little or no airflow present in a crash, result in a large volume of extinguishing agent covering the whole powerplant and the immediate vicinity. The existing container location for the two-shot engine extinguishing system more or less prohibits the use of that system under crash conditions. The systems previously suggested for locating extinguishing agent containers in the wings or nacelles would make them much more useful at the time of crash.

Work leading to the expansion of knowledge of aircraft fire problems already gained is being conducted at Indianapolis by the CAA, in an effort to keep abreast of new developments within the aircraft industry. It is realized that some of the objectives which result from our work are difficult to attain, and, in certain instances, are virtually impossible to attain. It must be borne in mind, however, that the degree of safety achieved will be directly proportional to the amount of effort and thought expended to achieve it.

Materials Substitution Plan for Turbojets

Method offered for rating engines by critical element content to simplify achievement of "non-strategic" jet.

The pressing need for a program aimed at eliminating use of critically short materials in turbojet engines was stressed at the recent annual meeting of the Society of Automotive Engineers, in Detroit.

The urgency to reduce use of strategic materials is emphasized by the probability of greatly increased demand for turbojets in event of war. This would place critically short materials in a stringent classification—both in cost and availability.

Turbojet makers were urged to tackle now, in an orderly fashion, the problem of finding substitutes for materials presently used—to avoid the frantic and costly search an emergency would bring.

Not only would the nation be better prepared, it was explained, but a dividend would accrue in lowered costs for turbojets.

A proposal for a comprehensive materials-substitution program was spelled out at the meeting by Jerard M. Pederson, Aircraft Gas Turbine division, General Electric Co. There is reason to believe, says Pederson, that such a program "can eliminate entirely the more critical elements and drastically reduce all other items of strategic importance" used in jet engines.

Ultimate goal would be development of a "non-strategic" engine having long-life characteristics equal to those of engines using the more strategic materials. But under present circumstances, "some loss in engine performance and perhaps life . . . would be expected. Such conditions might or might not be acceptable, but would require definite evaluation."

The basic requirements in setting up a turbojet materials substitution program, as proposed in Pederson's paper, are:

- A yardstick for measuring relative scarcity of metallic elements.
- A numerical rating system to give engineers a quick means of comparing this relative scarcity of elements and alloys. This would permit comparative rating of jet components and establishment of a strategic material use number for each turbojet.
- An intensive study of materials and operating conditions of engine components, permitting development of well-organized data to be used in guiding construction of "non-strategic" turbojets.

The yardstick to determine relative scarcity of metallic elements, according to Pederson, may be established from a consideration of these factors:

- Extent of natural resources in the United States.
- Adequacy of processing facilities producing elements from raw materials, including electrical power and fixed plant installations.
- Strategic locations of sources of sup-

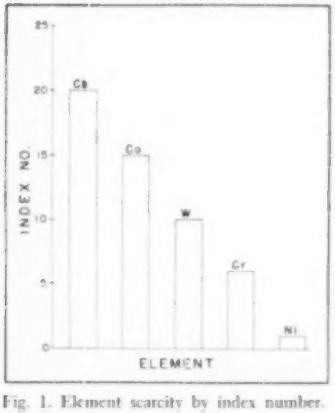

Fig. 1. Element scarcity by index number.

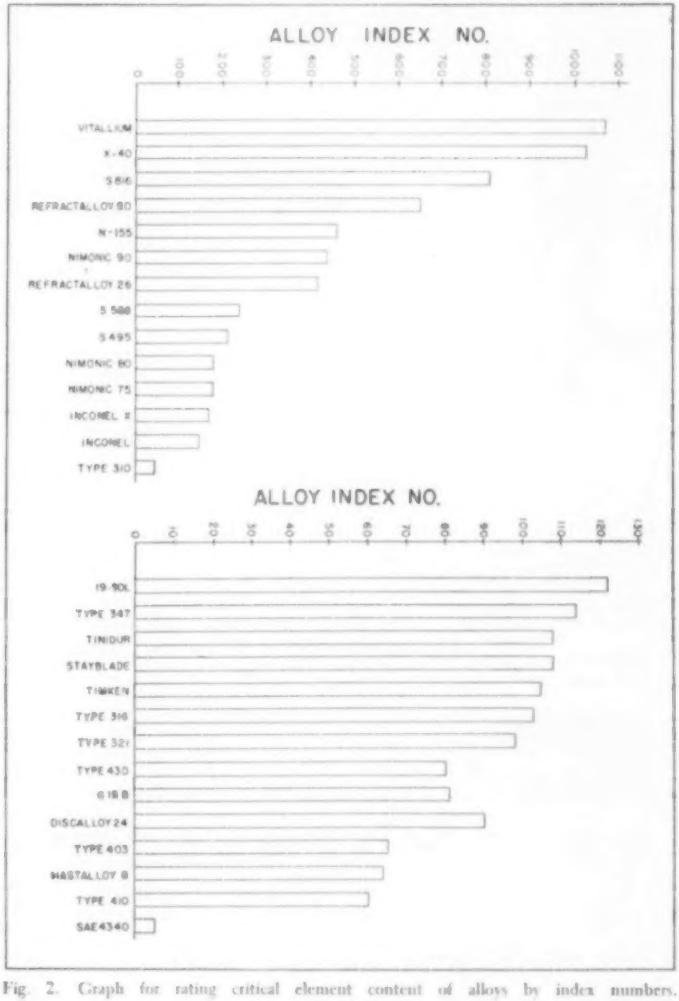

Fig. 2. Graph for rating critical element content of alloys by index numbers.

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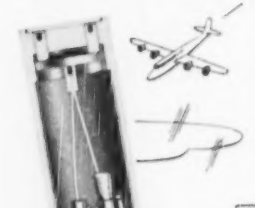

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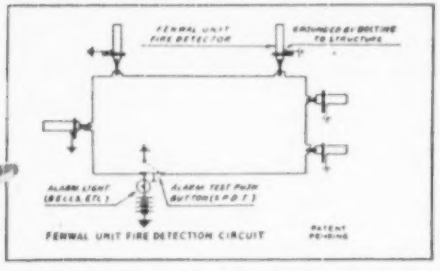
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ply, including raw material and processing sites.

• Supply of a critical element is dependent on M-day availability. The overall availability must be modified to conform to present and expected future requirements. If the planned usage rate increases, efforts must be weighed to provide sufficient supplies when needed.

• Successful development of an adequate substitute alloy or group of alloys containing smaller amounts of a critical element will change overall requirements for that element and its degree of criticalness.

Pederson points out that relative scarcity of critical elements as determined by factors above is constantly changing and any numerical system of comparison must stand periodic revision.

► **Rating Elements**—After establishing a yardstick to determine scarcity of elements, a system of rating can be devised to facilitate development of a substitute engine.

Some elements particularly pertinent to turbojets are columbium, cobalt, tungsten, chromium, and nickel. Certain of these are extremely critical and a method of numerical comparison is particularly valuable in showing their relative scarcity.

For example, rating the scarcity of nickel as 1, it may be found that chromium is 5, tungsten 10, and cobalt 15, times as critical. These elements are therefore rated at 5, 10, 15. Columbium may be rated 20 times as scarce.

This approach permits setting up a numerical rating system with each element given a relative index number (Fig. 1).

With this start, a numerical system for alloys can be devised. For example, chemical analysis of an important turbine-bucket alloy, S816, gives these percentages for critical elements: columbium, 4; cobalt, 38; tungsten, 4; chromium, 20; and nickel, 20.

► **Rating alloys**—Using the chemical analysis and the critical element index in Fig. 1, an alloy index number can be calculated. The formula for this is: Σ element percent point times element index number = alloy index number. Thus:

Cb–4 x 20 =	80
Co–38 x 15 =	570
W–4 x 10 =	40
CR–20 x 5 =	100
N–20 x 1 =	20
Alloy Index Number	810

In this way, index numbers can be calculated for alloys used in today's turbojets. Fig. 2 bar graphs show the index ratings for a number of alloys now used and also for some substitute materials. These show, for example,

that there is a considerable range of index numbers in the turbine bucket material field and in the group of sheet metal materials listed.

► **Rating Components**—In a manner similar to that used for calculating alloy index numbers, an engine component index number can be derived. Weight of the component simply is multiplied by the index number of the material used in the component to establish this rating.

From a complete engine analysis using this system, a turbojet overall strategic material use factor or number may be obtained. It then is possible to compare two engines with regard to the use of critical materials. Table I shows the numerical rating of components of a generalized axial flow turbojet designed without strategic material limitations.

Pederson emphasizes that this method of comparison "does not take into consideration differences in component part life or engine life. The comparison assumes both to have the same life."

To be strictly accurate, he says, the component part life of each engine would have to be established by tests and then "hours of life" could be included in the numerical analysis of strategic material use.

However, since establishment of a substitution testing program must precede test data on "hours of life," a direct numerical comparison of engines will provide necessary preliminary information on substitute parts.

► **Numbers Guide**—An engine study, using the numerical method, will result in proper substitution emphasis on particular parts. Those that require considerable amounts of the more critical elements will stand out as parts with high component index numbers (Fig. 3). Emphasis on such parts will serve as a guide in the establishment of priorities for development efforts.

Prior to the next logical step of considering each component part and selecting a substitute material of lower strategic importance, the requirements of an engine of less strategic material content must be established.

A program aimed at producing a substitute engine rated at the same life as the initial engine, with little or no loss in performance, will be quite different from one planned for the production of an expendable short-life engine.

A turbojet designed for a very short life would need to be one containing the very minimum of critical materials, as compared to a substitute engine designed to equal the longer life associated with a highly "strategic" engine —shown in Table I as possessing an index number of over 400,000.

► **Study Components, Materials**—Sub-

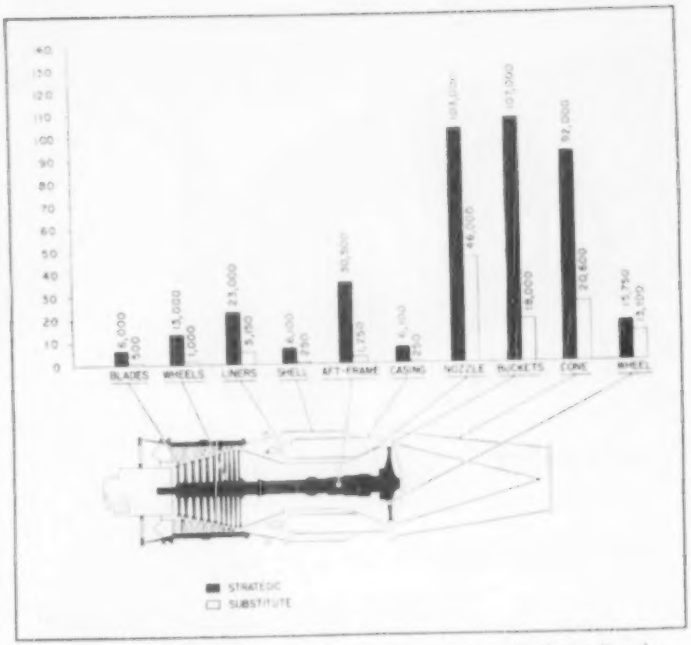

Fig. 3. Comparison of strategic material use in "unlimited" and "substitute" engine.

TABLE I—Strategic material use rating of components in "generalized" turbojet.

Part	Material	Approx. Weight, lb.	Material Index No.	Component Part Index Number
Exhaust Cone	N-155	200	460	92,000
Turbine Wheel	Timken	150	105	15,750
Turbine Buckets	Vitallium	100	1072	107,200
Turbine Nozzle Blades	X-40	100	1030	103,000
Turbine Casing	19-9DL	50	122	6,100
Combustion Liner	N-155	50	460	23,000
Combustion Shell	19-9DL	50	122	6,100
Main Frame	19-9DL	250	122	30,500
Compressor Wheels	Type 403	200	65	13,000
Compressor Blades	Type 410	100	60	6,000
			Engine Total	402,650

TABLE II—Number rating of "generalized" turbojet after materials substitution.

Part	Material	Approx. Weight, lb.	Material Index No.	Component Part Index Number
Exhaust Cone	Type 316	200	103	20,600
Turbine Wheel	Timken	125	105	13,100
Turbine Buckets	Nimonic 80	100	180	18,000
Turbine Nozzle Blades	N-155	100	460	46,000
Turbine Casing	Low Alloy Steel	50	5	250
Combustion Liner	Type 316	50	103	5,150
Combustion Shell	Low Alloy Steel	50	5	250
Main Frame	Low Alloy Steel	250	5	1,250
Compressor Wheels	Low Alloy Steel	200	5	1,000
Compressor Blades	Low Alloy Steel	100	5	500
			Engine Total	106,100

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stitution of one alloy for another calls for a thorough investigation of materials. The initial step is to determine the operating conditions of the component in question. The need for instrumentation to give a complete picture of operating stress levels and temperatures of parts, Pederson says, "cannot be over emphasized, for it is only with complete knowledge of the engine that successful substitutes may be selected."

Not only is knowledge of routine details such as temperature and stress required, but also temperature gradients, thermal shock conditions, vibration and other peculiar or "off design" engine operating characteristics.

Knowledge of these factors in a particular engine design will increase with development test time and the experience gathered in the field on production models. With as much of this information as possible on the engine part under consideration, a substitute material can be selected with some degree of confidence, he believes.

► **Selecting Substitute**—Knowing operating temperatures, stresses and other component factors, Pederson says a quick survey of critical index charts for alloys (Fig. 2) will provide some leads for the selection of a substitute. Thus, consider selection of a substitute for N-155 stainless steel sheet. Reference to the alloy index charts reveals several possible substitutes. The index numbers for Type 321, Type 310, Inconel, 19-9DL, and Type 316 stainless steel indicate possibilities for a saving in the use of strategic material if the required physical and mechanical properties for the component part "hours life" are met.

Pederson points out that some consideration should be given to use of materials having higher index numbers if it is possible to increase the life of an engine part, to the extent that more flying hours per pound of critical element are obtained. But, in general, the approach should be to achieve required engine life with material of lower critical element content.

From the engine data on component parts he says it may be possible to step completely out of the high temperature materials field and come up with a replacement alloy extremely low in strategic content or with an alloy that completely eliminates the use of the critical elements.

► **Redesign Parts**—In most instances consideration of the physical and mechanical properties of substitutes is concerned with direct material substitution in the initial design or the selection of a substitute coupled with a redesign of the part.

Pederson holds that this question often is decided by the lack of low

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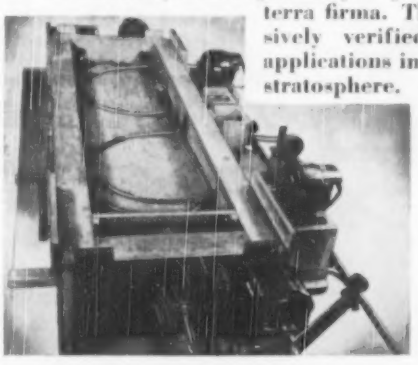

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strategic materials with adequate mechanical and physical properties, necessitating redesign of the part to ease the operating conditions. Redesign must usually provide for lower stresses (either steady state or vibratory) and cooling air flow, or some other means of easing operating temperature conditions.

Mechanical properties to be considered in selecting a substitute material are the same as those in the selection of a material for the initial design. Properties such as creep, stress rupture, fatigue strength, short-time tensile and yield strength and corrosion characteristics (particularly where the elimination of most or all of the critical elements are considered) must be taken into account. Properties such as thermal conductivity, coefficient of expansion, modulus of elasticity and density must be considered and properly evaluated.

After mechanical and physical properties of substitute materials have been considered, the problems of manufacturing must be solved. Processing variables such as formability, machinability, weldability and casting properties are extremely important in the development of a successful replacement alloy, Pederson says.

It is important to remember that successful development of an engine low in strategic material content or one that permits a decrease in strategic element use should result in an overall decrease in cost per turbojet flying hour.

► **Substitute Engine**—With the foregoing details of substitute material selection in mind and with the generalized turbojet (Table I) as the basic or initial design for a starting point, a probably adequate substitute engine can be established (Table II).

The term "probably adequate" must be used to indicate the lack of the necessary test and manufacturing data to prove out the material selections. Pederson maintains that experience along these lines must be obtained in the early phases of the manufacture of parts for test and from an exhaustive engine proof test program. Figures in Table II can serve only as a preliminary estimate.

It is believed some decrease in engine life and performance would be experienced with this engine, but the overall use of strategic materials would be greatly reduced.

According to Pederson, even in present turbojets which have no strategic material limitations, the national outlay of critical materials for these can be substantially reduced by:

- Increasing engine life so that planned requirements in number of turbojet engines are lowered.
- Cutting weight ratio of strategic raw material versus strategic finished material.
- Reducing weight of engine parts.

No Lacquer Needed

American Airlines has found as the result of one year's service test on a DC-6, that the zinc chromate primer and aluminized du Pont 1234 methacrylate type lacquer finish originally applied by Douglas on the exterior surfaces of the wing center section is unnecessary. Repainting these areas at each engine change involved considerable expense.

On the test plane, the surfaces in question were stripped clean and examined frequently for corrosion. Only incipient surface corrosion was observed and this could be easily removed by the application of Alumi-Nu Polish #9, Type 5060 Liquid Polish. On the basis of this service test, the paint was removed entirely from the center section Alclad surfaces on the remainder of AA's fleet; the flap gap area and magnesium slat were left in the painted condition.

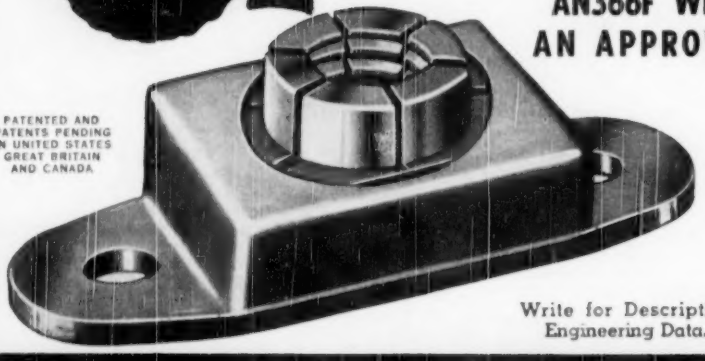
Airfoam Upholstery

Airlines using airfoam find it an excellent upholstery medium, judging from opinions heard at the recent ATA Engineering and Maintenance Conference at Kansas City. Although the initial cost is high, it requires less maintenance than conventional spring arrangements.

The NEW NUTT-SHEL
FLOATING TYPE SELF-LOCKING NUT

Here it is

30% WEIGHT SAVING
AN366F WIDTH
AN APPROVED



PATENTED AND PATENTS PENDING IN UNITED STATES GREAT BRITAIN AND CANADA

THE new "Nutt-Shel" Floating Plate Nut has the same dimensions as AN366F and AN362F Stationary Plate Nut.

Float approximately 1/32" from center in all directions.

This all metal plate nut is manufactured to comply with requirements of specifications AN-N-5 and AN-N-10 and may be used at temperatures up to 550° F. with high axial load.

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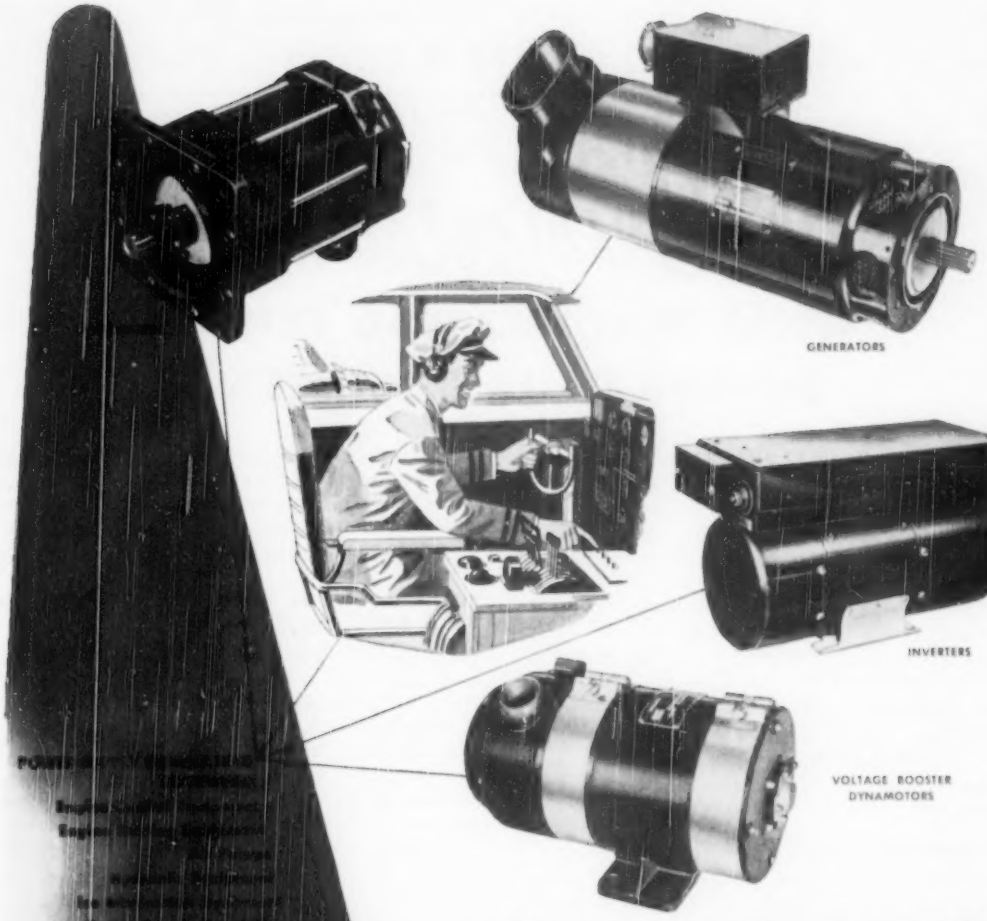

GENERATORS

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VOLTAGE BOOSTER DYNAMOTORS

Current You Can Count On!

From "switch-on" to "switch-off", the efficient operation of complex modern aircraft depends on reliable electric power. That is why Eclipse-Pioneer Power Supply Generating Equipment is the choice of plane manufacturers and airlines around the world. For Eclipse-Pioneer is backed by the oldest and finest reputation in its field, providing a line of products unsurpassed in progressive engineering and precision construction. When you choose your electrical power sources get the best, Eclipse-Pioneer—for current you can count on.

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AVIATION CORPORATION

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Mr. Businessman!

WHAT WILL THE 1950 CENSUS DO FOR YOUR BUSINESS?

CONSUMER MARKET INFORMATION

The 1950 Census will provide a huge amount of information about the characteristics of the consumer market. It will tell you what kind of income groups live where . . . what they have and what they need in the way of commodities from automobiles to television sets down to plumbing fixtures. The Census is an accurate survey of economic conditions in your market area. It will not only tell you *where* your customers are, but *what they need that you have to sell them!*

It will show where improved transportation and shipping facilities are needed . . . better harbors and waterways . . . stepped-up Public Service.

That is why the 1950 United States Census is vital to your business!

COOPERATION

You know that the Census-Taker is not just "counting heads." He's actually making a survey of existing conditions in industry, business, employment, housing, education. *You* know census information is as confidential as the vote you cast! Because you know all these things *you'll* cooperate with the Census-Taker in every way when he calls on you.

WHAT ABOUT THE OTHER FELLOW?

But! What about the people who work for you? The man in the shop . . . your own secretary . . . the fellows in the shipping room. Do they know all this about the Census? Chances are some of them do, so the idea is to get the right information across to those who don't!

WHAT'S THE BEST WAY?

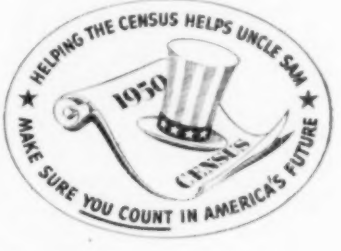
If it's possible, call everyone together and talk about it . . . ask questions . . . exchange ideas. If your outfit is too big for that, direct a Census information memorandum to all your employees. Post information on the bulletin boards. Run a Census story in the company house organ. Talk about it. *Every way you can . . . get the people who work for you to cooperate with the Census.*

WHAT DOES THE 1950 CENSUS MEAN TO YOUR EMPLOYEES?

Better schools . . . school buses . . . school lunches. It means finer roads, bridges and highways . . . increased transportation facilities . . . improved safety regulations. It creates more efficient Public Service and furthers adequate distribution of utility services such as telephones, gas, water and electric power. It will help your community plan better parks, playgrounds, recreation areas and housing. It will mean higher living standards and accurate congressional representation. The Census is *everybody's voice in America's future!*

YOU OWE IT TO YOURSELF . . .

Mister Businessman . . . to your business and your community! Put your efforts behind the 1950 United States Census for an even better country to live in . . . the *best* country to do business in!



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McGRAW-HILL PUBLICATIONS

SALES & SERVICE

MORE POWERFUL Franklin engine carries the executive version shown above in flight.

Improved Hiller 360s on Market

Executive model has specially polarized canopy and completely insulated and sound-proofed cabin.

Hiller Helicopters this year is marketing two versions of the Model 360—a utility and a "plush" executive version. Numerous improvements have been made in the 1950 line, making for higher performance and increased useful load.

The Palo Alto, Calif., builder has already started deliveries, and prices are announced as $21,495 for the utility craft and $23,975 for the executive model. (Price of the former Hiller model was $19,995.) Deliveries are being made in 90 days.

▶ **Improved Features**—The 178-hp. Franklin engine has been modified to develop 182 hp. This extra power plus some redesign has permitted an increase in the copter's gross weight to 2400 lb., and upped the utility model's useful load from 815 lb. to 968 lb. In spite of these weight increases, performance has been raised. Maximum cruising speed is listed as 84 mph., normal cruising speed 80 mph., range 200 mi., vertical rate of climb 400 fpm., maximum climb 800 fpm., service ceiling over 10,000 ft.

Some of the other detail improvements include: Redesign of the rotor system, giving better efficiency and flight characteristics; use of stainless steel control cables throughout for increased longevity and easier maintenance; improved heavy-duty and longer-wearing mercury-actuated clutch; strengthened tail boom-bearing mountings which provide insulation between metals and aid in corrosion control; modified carburetor air intake; flexible controls have been reinforced throughout; collective balance and automatic fuel pressure systems have been made standard.

▶ **Executive Highlights**—Custom appointments in the executive version include: Specially polarized canopy, completely insulated and sound-proofed cabin; combination cabin heater and windshield defroster; night flying installation including position lights, twin landing lights and flare assembly; enlarged instrument pedestal having Bendix PATR-10A radio transceiver, B-16 compas, sensitive altimeter, manifold pressure gage, and indirect controlled instrument lighting in addition to standard instrumentation.

BRIEFING FOR DEALERS AND DISTRIBUTORS

▶ **LINE SERVICE PAYS OFF**—Since Nov. 8, H. A. Mooter of Florence (N. C.) Aviation Services, and observer Charles Pack have been patrolling some 400 mi. of high tension lines for Carolina Power & Light Co. of Raleigh, thus highlighting another effective and steady income source available to many other airport service operators. Mooter and Pack cover 75 mi. of wire in three hours using a Piper Cub—a job which takes an eight-man crew about three days. In case a line repair is needed speedily, information may be radioed to base from the plane, permitting truck with linemen to be dispatched from the nearest point.

▶ **ADCO GROWTH**—Aviation Dealers Corp.'s second annual convention in Los Angeles pointed up rapid growth of warehousers' organization—in little more than a year—from an idea for lowering warehouse maintenance costs to a well-knit group comprising 20 warehouses which are situated throughout the U. S. and Canada.

▶ **AIRPORT HOUSEKEEPING**—Running into soft ground, ditches, snow, etc., ranked second as a cause of 100 landing accidents studied by Flight Safety Foundation, Inc., and points up need for the airport manager to insist on daily inspection of landing area and ramps and adequate marking of danger areas. Overshooting and undershooting were responsible for a like number of mishaps. Major cause was the stall, with collision ranking third. Average cost per landing accident was $817.

▶ **BEECH SERVICE ABROAD**—Beech service engineering reps are now engaged in an international program of free inspection of Bonanzas, extending to Europe and South America the program launched earlier this year in the U. S.

▶ **SCHOOLING GUIDES**—Two texts of interest to operators having pilots and mechanics training courses are 1950 editions of "Civil Air Regulations & Reference Guide for Pilots" and "Civil Air Regulations & Reference Guide for A&E Mechanics," published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Large type and two-column makeup is used. All the latest regulation revisions are contained. Paragraphs and sections are numbered according to the Government's new system. Operators are allowed liberal discounts on the list prices of $1.50 and $1.75 respectively per copy.

▶ **INSECT CONTROL DATA**—Dust sprayers planning to operate in Wisconsin this year can obtain copies of a report, "Insect Control Recommendations for Wisconsin in 1950," by writing University of Wisconsin, Extension Service, College of Agriculture, Madison, and asking for circular 287. The report is free.

▶ **HANDY AIRSTRIPS**—Contractors on Cedar Bluffs Dam in Trego County, Kans., are making good use of two airstrips temporarily leveled out next to the project for expediting close contact with work in progress. The strips are regularly used by eight planes, in addition to those flown in by sightseers. One strip is 2400 ft. by 150 ft., the other 2200 ft. by 150 ft. A permanent landing field is being projected close to planned recreational features at the dam.

FINANCIAL

Aircraft Value 'Yardsticks' Vary

Dividend policies and "normal" earning power shape market prices; book value has little effect.

Comparative Market Ratios

Listed Aircraft Equities

	Book value 1949 year-end (Per Common Share)	Market price April 15, 1950	Percentage market price to book Value	1949 earnings per common share*	Market price earnings ratio*
Beech	$14.52	$8.50	58.5%	$1.54	5.5
Bell	36.93	14.75	40.0	0.47	31.4
Boeing	42.77	28.75	67.0	4.07	7.5
Con-Vultee	13.22	14.25	107.0	1.60	8.9
Curtiss-Wright (common)	13.27	8.88	66.9	0.12	73.9
Douglas	123.66	80.00	57.6	9.19	8.7
Fairchild	7.04	5.88	83.6	0.68	8.5
Grumman	27.06	26.38	97.5	3.19	8.4
Lockheed	43.19	28.50	66.0	5.10	5.6
Martin	17.28	15.75	91.2	4.52	3.5
No. American	13.94	13.88	99.7	2.12	6.6
Republic	8.38	7.63	91.4	0.87	8.8
Ryan	11.21	5.75	51.3	0.91	6.5
United Aircraft	37.08	28.25	76.2	3.31	8.5

* Not adjusted for non-recurring income or charges.

In evaluating individual equities, investors frequently employ various yardsticks to measure relative market values. It is these cross-currents of different opinions which make the market and establish prevailing levels of quotations.

The aircraft group submits to this process every day in the marketplace and has developed a pattern of its own.

▶ **Book Value Puzzle**—One of the great anomalies to many observers is why a number of aircraft equities not only sell at substantial reductions to their book value but are frequently available at material discounts from their net working capital. The above table sets forth significant market ratios for the major listed aircraft common stocks.

It can be seen that Bell, for example, was recently available at 40 percent of its year-end book value. Ryan sold at slightly more than one-half of its last reported net worth. Only Grumman approximated its book value and Convair was the lone exception selling at a premium above its net worth position.

Were any of these companies on the verge of effecting a complete liquidation, book values would have great significance as far as market evaluations are concerned. But such is not the case.

Even in such instances as Douglas, where net working capital alone approximates almost $100 a share and the market price is now around 80 percent of such current resources, the evident discount is only of academic value. There is always the possibility, regardless how remote, that current working capital may be lost or frozen with the other assets of the company.

▶ **Earning Power is Key**—The main criterion has long been—and remains—earning power. The market in its own way is quick to distinguish between "normal" earning power and that of the non-recurring variety. For example, Martin shows the lowest market price-earnings ratio of 3.5 times. Actually, however, almost half of the company's 1949 reported earning represented extraordinary adjustments as distinguished from earnings from normal manufacturing activities. Allowing for such distortions, it is remarkable how similar the range of market price-earnings ratios for normal earning power as reported during 1949 is for most aircraft equities.

The flukes of the unusually high ratios for Curtiss-Wright and Bell are easily explainable. Curtiss-Wright, currently selling at 73.9 times its 1949 earnings, is a special situation where dividend policy has had no relationship to current profitability. In other words, $1.00 was paid per share last year and 25 cents thus far during 1950 out of accumulated earnings of prior years.

Bell, recently commanding a market price-earnings ratio of 31.4 times, paid $1.00 per share during 1949 while only earning 47 cents. Here, too, dividend policy made possible from accumulated earnings of past periods is the decisive consideration.

▶ **Standards Vary**—A former accepted market price-earnings ratio was around 10 times. However, this measure has long lost its character of inflexibility and it has been tailored to meet the enthusiasms of the times. Each industrial group has its own standard. Frequently, the less certain and more dubious the earning power of a company, the lower the price-earnings ratio.

Allowing for adjustments due to non-recurring income or charges, Douglas, United Aircraft, and Grumman appear to enjoy the highest current investor confidence in the marketplace.

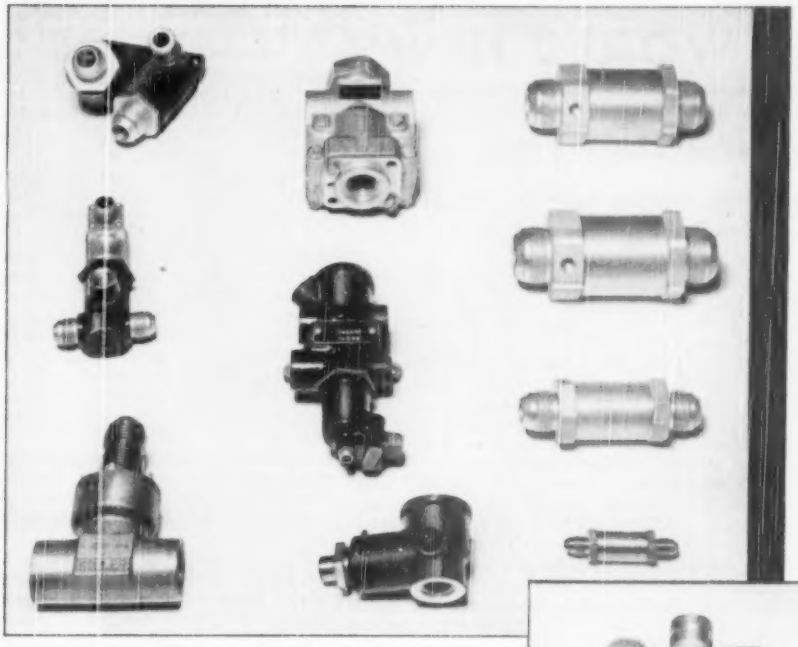
The next group enjoying a high relative investment regard appear to be Convair, Boeing and Fairchild.

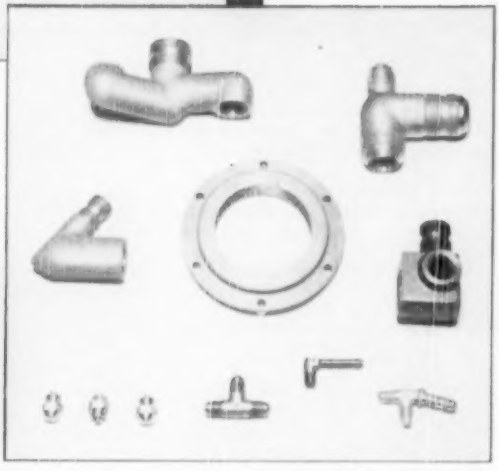
▶ **Dividend Policies**—A very important consideration which runs through investment judgment is dividend policies of the separate companies. Assuming sustained earnings prevail and a definite rate of dividend payments has been established, market quotations frequently gear themselves to a yield basis. For example, there is no doubt, that the $2.00 annual rate paid last year by Grumman, Lockheed and United Aircraft is a major factor in accounting for the proximity of market quotations for all three aircraft equities. In this instance, the average yield is better than 7.1 percent.

An established policy toward regular dividend disbursements is likely to increase in importance in obtaining favorable investor status for any equity. It must be remembered that the aircraft industry must seek investor support among those who are beguiled by intriguing earnings and dividends prospects among a broad list of attractive industrial, utility and even railroad securities. Many of these other industries command more stability in earnings and have less uncertainties than prevail among aircraft issues.

It is a serious mistake to assume that the accompanying market price-earnings ratios are static and will conform to their current pattern indefinitely. The marketplace is a dynamic arena. Investors and speculators alike are forever evaluating the continuing prospects of the separate companies with projections of likely 1950 earnings. It is these evaluations, constantly taking place, which will influence the course of aircraft equity prices and set the course for an ever-changing pattern of relative standings.

—Selig Altschul





Need precision parts for definite requirements?

LET KOHLER HELP YOU DEVELOP THEM

Many integral and precision products in the extensive Kohler line are designed and produced in close cooperation with the aircraft industry for specific requirements. Shown are a few of the valves and fittings developed for latest turbojet engines.

What parts do you need for special applications? Do your specifications call for a complex fuel or hydraulic valve, a high pressure swing check valve, a fuel dump valve? Whatever the need, we will help you with your problem. Experienced and skilled machine operators, complete manufacturing facilities centered in one plant, and exacting methods of testing and inspection, assure uniform high quality and prompt, accurate deliveries.

Send your specifications or requirements for valves or fittings for aircraft, automotive or industrial applications to Kohler Co., Dept. 16-U, Kohler, Wisconsin.

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AVIATION WORLD NEWS

Devaluation First Half-Year

Effect on international aviation mixed; it looks good in Great Britain, bad in France, indeterminate in others.

Devaluation of the pound last September did just what it was supposed to do, as far as British aviation is concerned. In France, however, it has caused some long faces. Elsewhere, including British Commonwealth nations, its effect is neither sharp nor yet in focus.

▶ **British Planes Attract**—Devaluation makes British planes relatively more attractive than American ones in Continental markets whose currencies went down along with the pound sterling. This helped British builders end 1949 with total exports of aircraft, engines, and accessories of £34,215,177, safely over the £33 million target set them by the government.

Trans-Atlantic fares, having been pegged to the dollar price, rose in the terms of the pound; fares to and from Europe, generally, have remained unchanged at the pre-devaluation sterling price.

▶ **French Picture**—French commercial aviation took a loss from the devaluation last September. Air France's case is a good example.

On the debit side the price of gasoline went up a net 16%. Gasoline accounts for roughly 16% of the company's total expenses so this adds up to an important loss. Air France imports nearly all its spare parts and engines from the U. S. and together they account for 10% of total expenditures. They are 28% more expensive now than before the devaluation.

The company also will be obliged to pay for six new Constellations delivered since the devaluation at the new rate of exchange. That will boost the price of the ships 28% and considerably increase amortization charges.

▶ **Receipts Outlook**—Receipts also were affected by the devaluation. But the picture here isn't as clear as for expenses. Fares on lines in the dollar zones have been increased 28% in francs. Continental European line fares which were based on the pound sterling have tended to drop following the revaluation of the franc with respect to the pound although British increases in sterling fares on many of these lines have limited these fare reductions to a few percent. Fares on most French empire lines still haven't been affected.

It still is too early to estimate what the net effect of these rate shifts will be on receipts. Odds are that increases in the franc price of fares on dollar lines will slightly outweigh reductions on other lines bringing net receipts slightly above the pre-devaluation level. But it is extremely unlikely that this increase will be big enough to cancel out increased expenses.

▶ **Private Lines**—Small, private, semi-scheduled French airlines were harder hit than Air France by the devaluation. Reason: Their costs in imported gasoline, spare parts, engines, and airframes went up in the same proportion as those of Air France. But since most of them operate on a much smaller scale, if at all, in the dollar zone, they didn't have corresponding fare boosts to compensate for increased costs. This has resulted in a considerable slump in the earnings of the private companies. But since seasonal factors play an important role here, it still is too early to make any quantitative estimates of just how serious a blow the devaluation will prove to have been.

▶ **Manufacturers Not Hit**—French aircraft manufacturers, on the other hand, were hardly touched by the devaluation. They get their two main raw materials, aluminum and steel, from domestic suppliers so that their total raw materials costs haven't varied appreciably. The industry doesn't export much—exports almost nothing to the dollar zone—so that its earnings from this source weren't affected.

The French Air Force has to pay 28% more for its imported engines and spare parts since the devaluation but this item doesn't bulk large in the total Air Force budget. In this connection the Hispano Suiza plant near Paris which manufactures all of the Nene jets used by the French Air Force has been a big money saver.

▶ **Swedish Are Optimistic**—Devaluation should ensure a long and full tourist season next summer, especially over the Atlantic. Enhanced value of dollar earnings in the home country should offset increased operating costs. Devaluation may mean slightly better chances for Swedish aircraft in non-devaluated as well as dollar-short markets.

▶ **Dutch Position**—KLM, operating all American equipment, has seen its prices rise, in proportion to devaluation. As devaluation was carried through after the summer season, its reaction on tourist traffic cannot as yet be judged. Business and freight traffic have not experienced any adverse influence.

▶ **What's up Down Under**—The slump in the pound-dollar exchange rate has lowered incomes of Australian and New Zealand airlines by 30.5 percent in terms of American money. Australia now offers one of the world's lowest air fares, averaging about 3 cents a passenger-mile on main routes. Because of the dollar component in operational costs, comprising aircraft and spare parts, instruments, radio equipment, lubricants and a portion of the aviation fuel, fare and freight increases may become inevitable.

Australia's government-owned TAA was losing money even before devaluation. The new conservative government is determined to take measures to wipe out this deficit.

New Zealand's new nationalist government is pledged to share the state-owned dominion airlines with private capital. To attract investments, rates may have to be hiked even though American equipment plays a smaller part in New Zealand's air transport economy than it does in the sister dominion.

▶ **South Africa**—Ticket costs between the Union of South Africa and the United States have risen as a result of devaluation. Return excursion fares offered by Pan American—the only direct route operator—have increased from £383 to £422. The ordinary one-way fare has risen from £208 6s. to £267 15s.

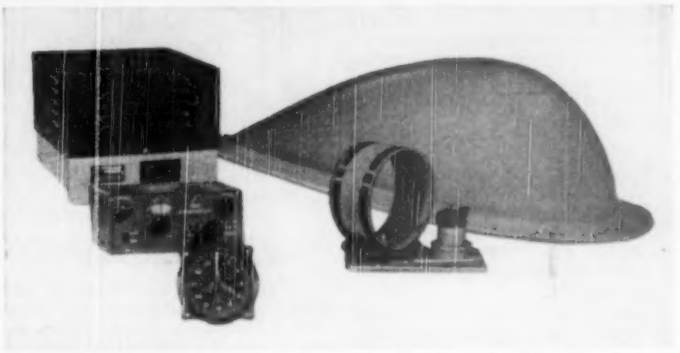
▶ **Brazil**—Brazil's commercial and military aircraft are almost 100% American. Parts and equipment come mostly from the U. S., and devaluation did not affect costs.

There is, however, the occasional case of a European firm, replacing old DC-3s with newer American or European equipment, offering stocks to Brazilian users at low prices.

▶ **Argentina**—Argentina's aviation industry is already beginning to recover from the upheaval created by devaluation of the peso last October, with most sources feeling that they are back, flying level again.

The most immediate effect was an overnight increase of 88 percent in the peso cost of overseas fares, with international carriers which had converted at the rate of 4.80 pesos to the dollar suddenly forced to make the operation at 9.05 pesos. It is generally agreed, however, that the resultant slump in passenger and freight traffic has been almost completely recovered already.

NEW AVIATION PRODUCTS



COMPACT ADF major components: tuner, amplifier, loop assembly, loop housing.

Develop Midget Direction Finder

Lear's Orienter Model ADF-12 weighs 18 lb.; claimed to meet USAF, CAA-ATC performance requirements.

An improved automatic direction finder designed for use in any type of aircraft has been developed by Lear, Inc. It is lighter in weight and at $695, is priced lower than any other ADF set produced in this country.

The new equipment is the Orienter Model ADF-12. It weighs only 18 lb., 7 lb. lighter than its forerunner, the ARC-10. It features an all-electrical system. Flexible shafting used in previous equipment has been replaced by Selsyn Motors.

►**High Performance**—With these improvements, the Grand Rapids plant seems to be grooming its new set not only for the light plane market, but also for competition with heavier, more expensive sets now used by the airlines and Air Force. Lear says performance is sufficient to meet USAF and CAA-ATC requirements.

Lear's earlier ADF equipment already is installed in Canada's Avro Jetliner. And it says its sets will be used in a Canadian military plane in the near future.

►**Midget**—Compared to sets designed specifically for airline use—those made by RCA Victor and Bendix Radio—the ADF-12 is a midget both in price and weight. RCA's set, the ARC-21, weighs about 50 lb. and costs about $2500. Equipment made by Bendix is still heavier. Bendix sets, on hand at the end of the war, are the only ones certificated for airline use. RCA says its set has run through all CAA tests successfully, but no certificate will be issued until airlines put them into actual use after their own tests.

AZIMUTH INDICATOR for Lear's set.

RCA points out that greater weight and cost of its sets are legitimate prices paid for better performance. It says its equipment is about twice as sensitive and more accurate than the Orienter under rigid CAA specifications.

Sensitivity of the Lear set is 3 to 5 microvolts for 6 Db signal to noise ratio at 500 milliwatts, while the AVR-21 is rated at .7 to 1½ microvolts for 6 Db signal to noise ratio at 50 milliwatts, using a 120mmf. antenna connected to the receiver through a 100mmf. transmission line. Compass accuracy of the ADF-12 is 2 degrees at 100 microvolts per meter. The AVR-12 has an accuracy of about 1 degree at 100 microvolts per meter, using a ¼ meter effective height, 70mmf. antenna.

Ground tests have shown the AVR-12 to have a range of over 200 mi. under average conditions on the East Coast. Lear says its set can reach stations about 150-200 mi. away. Range is hard to estimate accurately, since ground stations themselves may be weak or strong, depending on facilities and other factors.

ADF-12 components include a tuner, amplifier, azimuth indicator, loop assembly and loop housing. Standard installation kits for the Ryan Navion, Beechcraft Bonanza, Cessna series, Stinson and other lightplanes are available for $75 over the base price of the equipment.

The motor-driven loop assembly includes an electrical quadrantal error corrector. Loop is 5 in. in diameter and can be mounted externally in the plastic enclosure provided with the equipment, or in the aircraft's plastic nose or tail. The azimuth indicator, formerly connected to the loop by flexible shaft, now is operated electrically. Dual indicators can be provided.

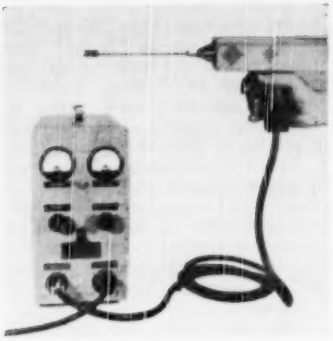
The amplifier assembly contains an a.c. inverter, a rectified d.c. power supply, a two-stage IF amplifier, compass amplifier, 2nd detector, automatic volume control, and three-watt speaker power amplifier. Other specifications of the set are: frequency range—3 bands, 200 to 440kc., 475 to 1050kc., 1000 to 1750kc.; controls—volume, function selector switch, vernier tuning control with illuminated shutter-type dial, dimmer, and band selector switch; selectivity—averages 4kc. at 6 Db down, 17kc. at 60 Db down; power consumption—3 amp. at 24v., 6 amp. at 12v.; power output—3.5 watts max., 2 watts undistorted.

Channel Strips

Extra tough gang channel nut strips are designed to serve as permanent fasteners for access covers, panels and similar parts which are constantly being removed and installed because of exceedingly rough use.

Produced by **Elastic Stop Nut Corp. of America**, 2330 Vauxhall Rd., Union, N. J., channel strips are made of high-strength 24S-T4 aluminum alloy. According to maker, this tough alloy "provides additional strength for unusual assemblies . . . where misalignment of sub-assembly components can result in twisted channel strips, or nuts pushed out." A new method of cut and raised dimpling also retains the nuts securely and prevents over-riding.

Nylon locking insert in each nut is stated to assure reusability for more than 100 applications. ESNA says "this factor means tremendous savings in long-range maintenance costs" for aircraft operators. Previous nut strips used on such assemblies had to be replaced frequently.



Air Leak Detector

(McGraw-Hill World News)

A new vapor sensitive detector which gives both audible and visible signals of leaks in air pressure lines in aircraft is being marketed by the **British Thomson-Houston Co., Ltd.**, Rugby, England.

Equipment consists essentially of a detector unit and control kit. Detector is a hand-held probe with a plastic-tipped metal nozzle. It contains an element sensitive to vapors of halogen compounds and a motor-driven impeller which draws air through the element.

When checking for air leaks, a halogen "tracer gas" is injected into the system so that any air escaping will carry a small percentage of the "tracer" which will be picked up by the detector.

A small loudspeaker built into the instrument emits an audible clicking sound. The frequency of the clicking increases when the detector picks up a leak. A visual indication is given by an increase in the meter reading on the control unit.

The tracer used is I.C.I. Arcton 6. This gas reportedly has no bad effects on components, is non-toxic, odorless, and can be liquefied at approximately 70 psi. It can be introduced into air pressure systems with small cylinders containing 1 to 2 oz. of liquid.

Instrument can detect leaks passing air at the rate of $\frac{1}{2}$cc./min. with a tracer concentration of less than 1 percent. In terms of an air pressure system having a total capacity of 300 to 400 cu. in. and operating at 1000 psi., this corresponds to a fall in pressure of 2 psi. in 24 hr. from any one leak.

Avionic Thermostats

Line of bi-metal disk and bi-metal strip thermostats made by **Stevens Mfg. Co., Inc.**, 69 S. Walnut St., Mansfield, Ohio, are hermetically sealed in corrosion-resistant metal enclosures and are said to be specially designed for avionic equipment subjected to dust, moisture or corrosive atmospheres. Permanent sealing prevents sulphiding and deterioration of silver contacts. Operation is from −60 to 600F.

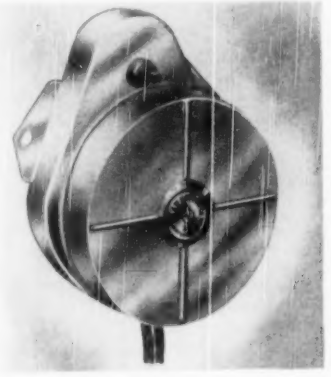
Terminals are sweat-soldered into inert metal tubes interfused with inorganic glass insulator bead in the closure. Units feature electrically independent bi-metal thermal control elements that eliminate artificial cycling or "jitters." Comparative performance curves and specifications are available on request.

Cleans Carburetors

For speedier, more thorough cleaning of light plane carburetors and intake manifolds, **Excelo Mfg. Co.**, 1107 S. Fremont St., Alhambra, Calif., introduces Expel-It.

Maker states product removes harmful gasoline gums without need for removing, dismantling and "boiling" out the carburetor. And it "does this job thoroughly and effectively in 15 to 20 min."

Company says a reputable and independent testing laboratory in California has submitted a sworn statement that use of Expel-It resulted in more horsepower and higher fuel economy.

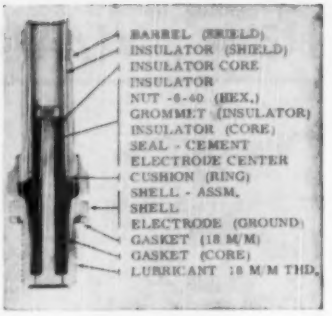


Sealed Timers

New timers, "ideally suited to any application involving corrosive atmospheres or high humidity . . . encountered in aircraft," are offered by **A. W. Haydon Co.**, Waterbury, Conn.

Timers are claimed to be specially suited for military use. They are contained in hermetically sealed enclosures to give maximum protection against fungus growth, salt spray, humidity, oil spray, sand and dust, explosive atmospheres and climatic changes.

Enclosures are evacuated to 100 microns and filled to one atmosphere with dry nitrogen so that full switch ratings can be used at extremely high altitudes. Deterioration of motor brushes is said to be completely eliminated.



New Spark Plug

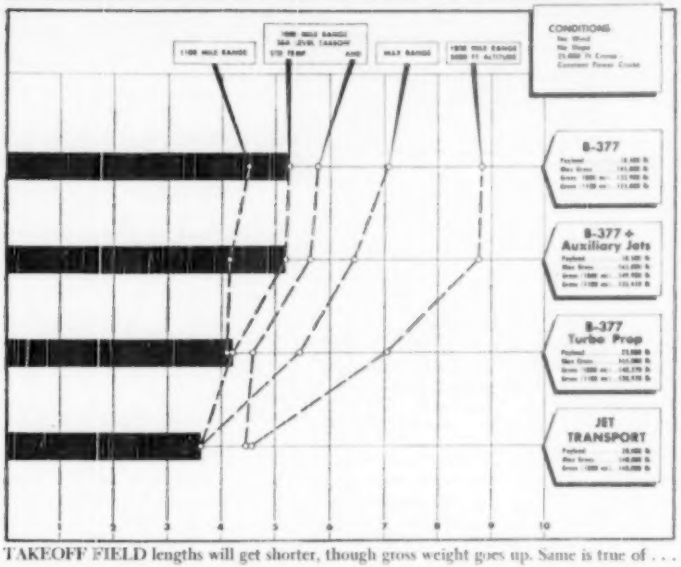
A new type of aircraft engine spark plug, whose "self-scavenging" design differs basically from other plugs currently on the market, has been announced by Fred P. Dollenberg, president of **Hahn Aviation Products, Inc.**, 2636 N. Hutchinson St., Philadelphia 33, Pa.

The unit, designated the Hahn Model LS702, incorporates an eccentrically mounted annular center electrode whose design was originally patented by Lewis Hahn in 1934. Since that date, constant development resulted in the first experimental model tested in 1941. "Bugs" were progressively eliminated and the plug was first installed in a commercial airliner in 1947. It has been approved by the CAA.

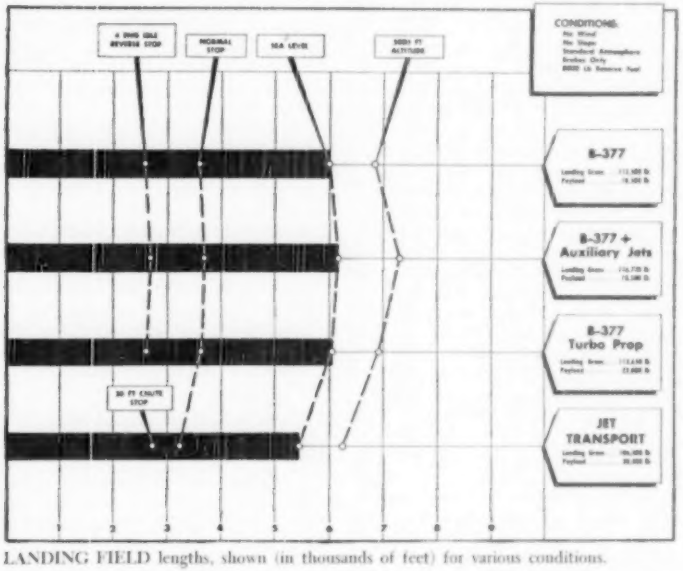
An interesting feature of the Hahn plug is the self-cleaning action afforded by the center electrode. This is achieved by providing a chamber directly behind the two electrodes into which the mixture is forced by the compression stroke. When the explosion occurs, this mixture also ignites and cleans the center electrode as the gases re-enter the combustion chamber. The unit contains no "critical" materials and is of simple construction, consisting essentially of an outer shell, a frustro-conical heat-dissipating copper ferrule, and a specially developed ceramic insulator cemented to the center electrode with a new type of non-hardening adhesive.

Elimination of costly materials and ease of assembly will make the plug competitive with the least expensive currently available units, the manufacturer claims. It is said to be suitable for installation in all radial engines from the R1820 to the R4360. Laboratory tests indicate the Hahn plug has averaged 305 lb. I.M.E.P.

Capital Airlines service-tested this spark plug two years ago and obtained as high as 370 hours utilization before change. They have recently purchased 2000 more plugs which are in the process of being evaluated at this time. Colonial Airlines and the Navy are also interested, the manufacturer says.



TAKEOFF FIELD lengths will get shorter, though gross weight goes up. Same is true of . . .



LANDING FIELD lengths, shown (in thousands of feet) for various conditions.

Future's Planes vs. Today's Fields

Plans for new transports outstrip present airports, but engineers feel they can tailor planes to fit.

Airport limitations at many important U. S. cities have brought dreams of tomorrow's transports down to earth.

In many respects, blueprints for commercial aircraft of the future seem far ahead of plans for getting the ship on and off the ground and servicing it while at the terminal. But engineers are confident they can tailor jet and turboprop transports to the capacities of the airports which will have to handle them in the future.

D. A. Buck, sales engineer for Boeing Airplane Co., explained this point of view in a recent paper delivered before the third annual meeting of the Airport Operators Council in Cleveland. To illustrate, he cited the planned progressive development of the Stratocruiser (AVIATION WEEK May 1).

▶ **Runway Needs**—As the Stratocruiser's power and gross weight are increased through addition of auxiliary jet pods, and later by use of turboprops, the ship will require less, rather than more field length, according to Buck. And airport runway requirements can be reduced even further when the Stratocruiser is replaced by a pure jet design.

Buck's conclusions are based on comparisons of Civil Air Regulation takeoff field length requirements for an 1800-mi range on a standard day and at a sea-level airport.

The Boeing sales engineer noted, however, that the pure jet is penalized more than other planes by hot day conditions. Under the worst conditions of AHD (Army Hot Day) takeoff with maximum gross weight at a 5000-ft. altitude airport, Boeing's proposed 140,000-lb., 75-passenger pure jet transport would require 5925 ft. of runway. At sea-level and standard conditions, it would take only 3600 ft.

▶ **Better Jet, Better Job**—The jet transport discussed by Buck would be capable of operating from 6000-ft. runways, which are available at many airports. But the Boeing official observed that a more efficient jet plane—designed to produce more ton miles per hour—could be built if one main 7000-ft. runway were available at these cities.

This runway would satisfy requirements of the improved plane under wind velocities from zero to 30 mph. in any direction. With any crosswind component of more than 30 mph., a 5800-ft. right-angle runway would more than satisfy operating requirements.

▶ **Chute to Stop**—Jet transport takeoff field lengths quoted by Buck are based on deceleration rates for the accelerate-and stop-distances that assume the use of a moderate-sized parachute released at the point where the decision to stop is made. Such chutes have been tested extensively by Boeing, and the company considers them as reliable as any other braking system.

With no propeller to be reversed, Boeing feels that installation of such a chute for at least emergency use is a very desirable precaution. In actual operation, the chute can be released prior to landing, the jet wake keeping it inflated and off the ground even when the plane is stopped.

A correctly installed HI-SHEAR rivet visually reveals a collar neatly trimmed, the right pin length and the proper grip.

FAST VISUAL INSPECTION with HI-SHEAR RIVETS

HI-SHEAR rivets are visually inspected. If the outside appearance is correct the inside is correct. If anything is wrong with the installation it can be seen. An incorrectly installed rivet is easily replaced.

No special inspection tools or gages are required. Torque checks are eliminated. Inspection of HI-SHEARS permits a rapid and accurate check for good workmanship.

Other HI-SHEAR features

- HI-SHEAR design means smaller fittings and lighter structure.
- Reduces parts and machining—they mold to a rough or sloped surface.
- Draws the work together.
- Offers a broad range of styles and sizes.
- Permits smaller and lighter riveting equipment, hence, less worker fatigue.
- Installation speed — six HI-SHEARS to one bolt.

U.S. and foreign patents—Trademark registered

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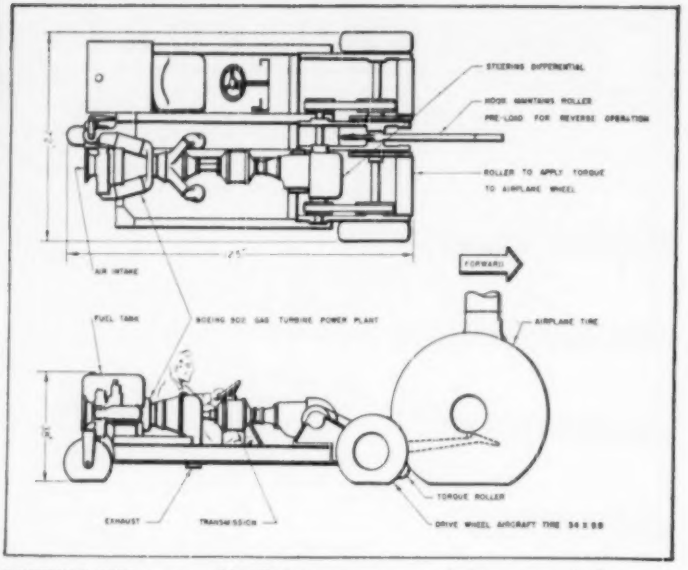
HERMOSA BEACH, CALIF.



BOEING'S TUG can ground-handle jet transports to save fuel, increase payload.

A small drag parachute gives approximately the same decrease in landing-roll distance as two propellers in idle-reverse.

Landing field length requirements for auxiliary jet-pod Stratocruisers and turboprop Stratocruisers slightly exceed requirements of the present model. This is because of the higher landing gross weight resulting from increased payload or powerplant weight.

► **Turbine Tug**—Ground handling and moving of commercial jet transports to the takeoff position remains an unsolved problem, Buck says. Jets might use around 1000 lb. of fuel—equal to five passengers—in taxiing to the takeoff position. So some other way of moving the planes seem necessary.

Boeing has developed a small self-propelled and steerable tug to meet this difficulty. Weighing about 2800 lb., the vehicle can move a fully-loaded plane 15 mph. and travel free at a speed of 30 mph. The tug can steer and brake an unmanned plane forward or backward.

Power for the tug is a small gas turbine geared to two rollers that bear against the main gear and utilize the airplane weight for traction of the wheels. The turbine power has the advantage of quick starts and full available power in cold weather, and the ability to provide a source of hot or cold air for ground conditioning of the plane. And an air source is available for starting the plane's turboject powerplants at end of runway.

► **Little Blow**—Buck stated that the wake of jet transports should have little effect on terminal areas, spectators and runway surfaces, since the wake patterns are quite local. Analysis of an advanced-type large turbine jet unit mounted at a small angle, with the center line of the nozzle 50 in. above the surface, indicate that the maximum ground temperature would be about 275 deg. F. for short intervals at runup and takeoff with full power.

All terminal and taxi operations would be at the idle-thrust condition, where ground temperatures would approximate 180 deg.

Velocity at maximum thrust at a distance of 50 ft. from the nozzle (a position near the plane's tail) would be about 350 ft. per second, equal to a 238-mph. wind. At 100 ft. the velocity drops to 79fps.—equal to a 48-mph. wind. During idle-thrust, the velocity at the 50 ft. distance would be about 50fps.—or the equivalent of a 34 mph.-wind.

Backs Copters for Inter-City Hauls

The suggestion by Eastern Air Lines Chief Engineer Charles Froesch that helicopters could provide cheaper and faster short-haul inter-city travel (AVIATION WEEK Apr. 17) has been seconded by Clarence M. Belinn, president of Los Angeles Airways, in a talk before the Airport Operators Council Third Annual Meeting and Conference in Cleveland.

Belinn, whose helicopter service has been successfully carrying the mail for two and one-half years, added this new note: He's certain helicopters are the best means of generating additional airport traffic and making the journey

of airlines passengers more comfortable and convenient.

▶ **New Generator**—He said an intercity helicopter feeder system would generate traffic which at present does not exist. He based this prediction on the experience of his mail routes. LAA's statistics show that a great number of suburban citizens now using airmail didn't previously because its effectiveness was curtailed by loss of time in connecting with airlines at the terminal.

Helicopters will generate more passenger traffic in a similar manner, Belinn said.

▶ **Play All Stops**—Greatest emphasis of the feeder is bringing traffic to and from terminal points. For example one feeder makes ten stops between San Francisco and Los Angeles. About 80% of its passengers are trade center passengers. And the great flood of passengers to Los Angeles begins about half-way.

A feeder into a metropolitan area might service not a dozen stops, but one hundred fifty. Included would be towns and villages which have only bus transportation now. Belinn thinks that would bring Los Angeles airport several million additional passengers a year.

▶ **Fast Start, Slow Finish**—Belinn thinks current plans for jet transports are another good argument for helicopter inter-city travel. When jet transports bring Chicago as close to Los Angeles as San Bernardino now is, (57 miles east, but 70 miles from the airport), it just won't be practical timewise to finish an air journey with a long ground trip. Connecting helicopters could save time here.

Belinn's plans give equal consideration to the great percentage of passengers whose trips end in the downtown section. He hopes eventually to provide helicopter service for the same cost as taxi or limousine service to the airport. He expects it will take longer to solve that problem since he feels operations of helicopters into the center of congested areas will have to await multi-engine machines which do not appear forthcoming in the near future.

Lightplane Service

Ross Aviation Corp., St. Louis, in conjunction with BACA Airlines, Jefferson City, Mo., has started scheduled lightplane service between the two cities.

BACA operates a Cessna 170 on a morning roundtrip flight, and Ross makes an afternoon run with a Cessna 190. BACA also has a daily schedule from Jefferson City to Springfield and Kansas City, Mo. Mid-Continent Airlines, the only carrier certificated into Jefferson City, is not providing service because of airport conditions.

Foreign Airline Equipment

(Transport Types Only)

Manufacturer	Model	No. in Service	No. of Engines	No. of Pass.	Country of Mfr.
Douglas	DC-3	1,095	2	21	U. S.
Douglas	DC-4	143	4	44	U. S.
Vickers	Viking	92	2	24	England
Avro	Anson	77	2	6	England
De Havilland	Rapide	76	2	5	England
Lockheed	Lodestar	72	2	18	U. S.
Lockheed	Constellation	60	4	48	U. S.
Douglas	C-47	54	2	21	U. S.
De Havilland	Dove	48	2	11	England
Canadair	DC4M2	46	4	40	Canada
Noorduyn	Norseman	41	1	8	Canada
Avro	York	38	4	21	England
Consolidated	Catalina	38	2	18	U. S.
Bloch	Languedoc	37	4	32	France
Junkers	JU-52-3	37*	3	17	Germany
Douglas	DC-6	36	4	52	U. S.
Beech	C-45	34	2	6	U. S.
Consolidated Vultee	Convair	32	2	40	U. S.
De Havilland	Dominie	25	2	5	England
Lockheed	Electra	24	2	10	U. S.
Curtiss	Commando	22	2	40	U. S.
De Havilland	Dragon	22	2		England
Avro	Lancastrian	21	4	13	England
Airspeed	Consul	16	2	6	England
Cessna	C-78	16	2	4	U. S.
Lockheed	Hudson	15	2	14	U. S.
Short	Solent	15	4	24	England
Bristol	Wayfarer	12	2	34	England
Short	Sandringham	12	4	37	England
Short	Plymouth	11	4	22	England
Siebel	204	10	2	8	Germany
Airspeed	Oxford	9	2	8	England
Avro	Tudor	9	4	32	England
Consolidated	Liberator	9	4	30	U. S.
Fiat	G-12	9	3	26	Italy
Grumman	Goose	9	2	6	U. S.
Travel Air	Travel Air	9	1	5	U. S.
Boeing	247D	8	2	13	U. S.
Caudron	Goeland 449	8	2	6	France
Douglas	C-54	8	4	44	U. S.
Savoia-Marchetti	SM-95	8	4	41	Italy
Short	Sunderland	8	4	22	England

*An additional undetermined number is in use.

(Russian-built planes used in the Soviet Union and satellite countries are omitted because of incomplete data.)

U.S.-Built Planes Carry the Load

Despite efforts by manufacturers in other countries, 78% of world's scheduled transports are American.

The world's airlines are still largely dependent on U.S.-built transports despite intensive efforts by manufacturers in other countries to narrow the margin of American supremacy.

A newly completed survey by the Civil Aeronautics Board's Foreign Air Transport Division shows that about 78 percent of the aircraft used by scheduled airlines outside of Russia are of U. S. manufacture, 15 percent British, and 7 percent come from other countries. In the Western Hemisphere, 92 percent of the airline transports are U. S.-built and 4 percent British; while in the Eastern Hemisphere the ratio is 62 percent American and 27 percent British.

(Last year's study showed 77 percent of the world's airline planes were American-built and 15 percent British.)

▶ **Top Builders**—Of the 3775 planes included in the survey, 78 percent were built by five manufacturers: Douglas

The Theory and Design of Gas Turbines and Jet Engines

1. A new book that gives concrete examples of the application of aerodynamic and "gas dynamic" theory to actual design problems. Discusses parameters affecting performance characteristics of turbines and investigates limitations imposed by design, materials, etc. Covers gas flow, jet-propulsion devices, fuel systems, regenerators, etc. By E. Vincent, U. of Michigan, 509 pages, $7.50

Gas Turbines for Aircraft

2. An accurate reference book on the design and operational principles of aircraft gas turbines. Discusses components and cycles, controls and accessories, hybrid types of power plants, and the performance of aircraft powered by gas turbines. Covers compressible gas flows, afterburning, water injection, and other recent advances in the field. By F. Godsey, Westinghouse Elec. Corp., and L. Young, Rand Corp. 387 pages, $4.50

Engineering Supersonic Aerodynamics

3. Provides essentials for designing and predicting supersonic aircraft performance and latest data on aerodynamic characteristics of delta wings by Puckett, Stewart and others. Covers compression and expansion waves, airfoil characteristics, bodies of revolution, supersonic wind tunnels, and composite design and performance. By A. Bonney, Johns Hopkins Univ. 294 pages, $4.00

Aircraft Structures

4. Shows the design engineer how to supplement structural theory with design specifications and material properties applicable to his particular airplane. Explains the application of the principles of mechanics to the analysis of aircraft structures and shows how to solve the problems of deflections and statically indeterminate structures. By Davis J. Peery, Penna. State College. 566 pages, $6.50

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2132, Lockheed 265, Consolidated Vultee 217, de Havilland 197 and A. V. Roe 153. But if the number of Russia-manufactured planes could have been included in the total, Ilyushin undoubtedly would have been among these leaders.

A breakdown of airline transports operated by foreign carriers alone shows 1095 of the ubiquitous DC-3s. Other transports among the top ten on foreign airlines, with the number in use in parentheses, are: DC-4 (143); the postwar, medium-range, twin-engine British Vickers Viking (92); the short-haul, six-passenger, twin-engine British Avro Anson (77); the prewar, five-passenger, twin-engine de Havilland Dragon Rapide biplane (76); Lockheed Lodester (72); Lockheed Constellation (60); Douglas C-47 (54); the postwar, twin-engine eleven-passenger de Havilland Dove feederliner (48); and the postwar, 40-passenger, four-engine Canadair DC-4M (46).

► **Area Count**—The CAB survey showed that 1266 of the 3775 transports operated by all the world's scheduled airlines are used in North America. Another 871 are in Europe (outside of Russia), 485 in South America, 420 in Asia, 283 in Australasia, 259 in the Central American area, and 191 in Africa.

American-built transports outnumber British-built craft on all continents. Even in Europe more than 500 of the 871 transports listed are of U. S. manufacture.

Insofar as the foreign airlines are concerned, the DC-3 is more numerous than ever. The 1095 twin-engine Douglas workhorses listed in the current survey compare with 1093 in the CAB study of one year ago.

On the other hand, such relics as the tri-motored Junkers and Ford—and even the de Havilland biplanes—are at last passing rapidly from the foreign air transport scene.

RUSCO for Safety Belts

Here is another example of Rusco Research, a shoulder strap for every Rusco Safety Belt.

Good practice requires that safety belts be replaced periodically.

Why don't you replace yours now with a famous Rusco Safety Belt.

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JETLINER GOES SIGHTSEEING

New Yorkers got their first glimpse of a jet transport when the Avro Canada Jetliner flew over during its visit Apr. 18-21. It was inspected at New York International Airport by several hundred U. S. engineers and airline industry personnel. The trip from Toronto took about 59 min., approximately half the time for present scheduled airliners. The Jetliner demonstrated short takeoff and steep climb, and low-level slow- and high-speed maneuverability. The craft is now being readied to fly the Atlantic to attend the Society of British Aircraft Constructors show in England Sept. 5-10. This will be the first trans-Atlantic crossing by a jet transport. The Jetliner is also scheduled to tour Europe and Australia.

TWA Name Change

Trans World Airline, Inc., used by TWA as a trade name since it began overseas service in 1946, has now become the carrier's official corporate designation.

The change from Transcontinental and Western Air, Inc., was voted at the company's recent annual stockholder's meeting. Necessary papers will be filed in Delaware, where TWA is incorporated.

Stockholders also approved an employes' retirement plan and reelected all officers and directors. President Ralph Damon reported that on the basis of preliminary estimates, first-quarter 1950 financial and traffic results were better than in the same period last year.

FLY-BABY

Eight-months old Jill Spencer gazes with juvenile wonderment at the latest creation of Continental Air Lines' agile-minded flight service department, which has prepared these flight certificates to be given young children flying the airline as a memoir of their first flight. "Diploma" carries details of the trip and is signed by all members of the crew.

Pilot Files Suit Against Transocean

Edward Bessey, pilot of the Transocean Air Lines DC-4 which last August overshot the Shannon, Eire, airport and landed in the Atlantic Ocean, near the Irish Coast, has brought a $200,000 libel suit against his former employers.

The suit, filed in Santa Clara County (Calif.) Superior Court, charges that Transocean sent Bessey a letter calling him an incompetent flight officer. Bessey said the latter damaged his reputation as a pilot and prevented him from securing further employment. He asks $100,000 general damages and $100,000 compensation for loss of his annual pay of $12,000.

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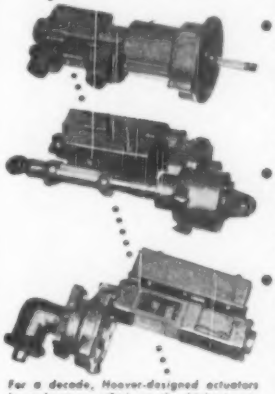
High performance airplanes demand high performance actuators with maximum load capacity, life and reliability. Hoover units are measuring up to the most severe test and flight conditions on production airplanes and now planes still in test stage.



- To solve a difficult pressurization problem on a heavy bomber, Hoover designed this actuator which is controlled by a direct pressure measuring device through a potentiometer. It includes a 9360 to 1 triple planetary reduction gear, and the motor shaft can be braked so sharply that travel of the output shaft is limited to ½ degree.
- This actuator was designed by Hoover to withstand the severe loads encountered during in-flight adjustment of the horizontal stabilizer of a jet fighter. The actuator weighs only 12.5 pounds, yet will withstand an ultimate load of 15,000 pounds without failure.
- For positive cockpit sealing, Hoover built into this power unit a unique torque limiting clutch with no frictional parts, the load being transmitted by spring-loaded rollers. It has operated 5,000 consecutive times with a maximum variation in torque of 15% from specified value.

For a decade, Hoover-designed actuators have been specified on the highest performance airplanes. Consult us for the solution to your actuation problems. Experimental or Production quantities.

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ELECTRICALLY POWERED (shown here) for 1/16" to 1/4" diameter solid steel rivets up to 7/8" long.

AIR POWERED for aluminum alloy rivets up to 1/4" diameter or steel rivets up to 1/8" diameter, up to 3/4" long.

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TOMKINS-JOHNSON RIVITORS

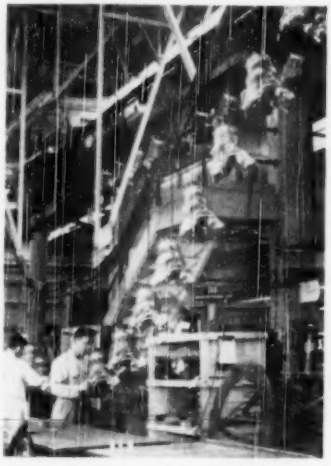
Approach Light Systems Analyzed

Civil Aeronautics Administration's slope line approach lighting system gets high marks in a report by the agency, covering analysis of eight different methods.

The slope-line technique furnishes the sharpest indication of direction, the only accurate indication of altitude, and the only accurate information as to lateral position with respect to approach axis regardless of attitude, according to R. E. Warren, of CAA's airport development division.

The Calvert system is credited with permitting a rough estimate of altitude when two of the cross bars are seen simultaneously. And Calvert's horizontal cross bar is said to furnish the best indication of attitude. It is noted that any of the systems not giving good attitude information could be improved by adding horizontal cross bars.

Twelve studies were made of each of these techniques: Axial single line, double row, double row with satellites,



ESCALATOR FOR CYLINDERS

United Air Lines' new "push button" maintenance base at San Francisco uses this 1650-ft. overhead chain conveyor for storing reconditioned cylinders. After an engine is disassembled and taken through a washing process, the reconditioned and reassembled cylinders remain suspended on the conveyor (driven by a 2½-hp. electric motor) until time for reassembly of the engine. Because of a thorough system of checks and counter-checks, twelve days are usually required before an engine is reassembled and ready for testing. Parts are numbered so that in reassembly one engine will not be combined with another. UAL overhauls nearly 100 engines monthly at the San Francisco base.

funnel, slope line, part of flight, multi-line, and the Calvert bar system. The studies showed how each pattern would appear to the pilot from various points. Four of the studies assumed unlimited visibility while the other eight considered the lights visible for 1000 ft.

The studies are described in the report, "Perspective Analysis of Approach Light Patterns," technical development report No. 96, sponsored by CAA, technical development, Indianapolis, Ind.

Cockpit cut-off templates are included for three types of airliners, and may be placed over the perspective drawings given to show the cut-off effect.

▶ **Systems Pros and Cons**—Good points and faults of the various systems are analyzed briefly as:

• **Direction:** Double row with satellites, slope line, path of flight and Calvert are adequate. Others are adequate if attitude is known.

• **Altitude:** Slope line is adequate, all other systems are tagged inadequate.

• **Attitude:** Double row with satellites, path of flight, and Calvert are designated adequate; slope line is termed difficult to interpret if lateral error is present; others are said to be inadequate.

• **Lateral position:** Slope line is adequate others are marked inadequate unless attitude is level.

CAB Turns Down $1-a-Year Mail Offer

Applications of Air Transport Associates, Seattle, and Golden North Airways, Fairbanks, Alaska, for exemptions to carry first-class mail between Seattle and Alaska for the nominal rate of $1-a-year have been rejected by the Civil Aeronautics Board.

The two irregular carriers said that if they were permitted to operate on a regular schedule they would perform the mail service and save the government millions of dollars in payments now allotted to Pan American Airways, Northwest Airlines and Pacific Northern Airlines. CAB ruled that the complex and important issues raised by the exemption request could be handled more appropriately in an application for a certificate.

SHORTLINES

▶ **Air Line Pilots Assn.**—ALPA councils of Pan American Airways and Panagra are at odds over PAA's request that the Civil Aeronautics Board extend the agreement whereby Panagra planes arriving at Balboa, Canal Zone, from South American points are, together with crews, chartered by PAA and

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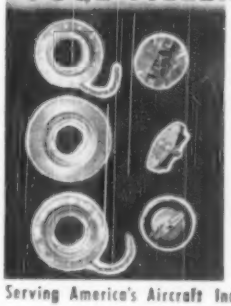

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flown over PAA's certificated route to Miami. Panagra pilots fear some of their number would be discharged if the through-flight pact is terminated. Besides, they like being based in Miami where 31 Panagra pilots now live and some have bought homes in the famed resort area.

▶ **Air Transport Assn.**—Expects air mail volume to soar markedly as a result of the Post Office's decree to limit regular home delivery routes to one-a-day.

▶ **Civil Aeronautics Board**—Chairman Joseph J. O'Connell, Jr., predicts that within 30 years all major U. S. cities will be linked with all principal cities of the world by jet transports cruising at least 600 mph. He thinks much of the local passenger air service and intra-city connecting service will be via helicopter.

▶ **Continental Charters, Inc.**—The Miami-based nonscheduled operator has asked CAB permission to carry agricultural and contract laborers between the U. S., the Bahamas, Jamaica and other British West Indian points from May 1 to Nov. 30, 1950. Company leases three C-46s from the Air Force, according to John A. Belding, president of Continental Charters, Inc.

▶ **Delta**—Has objected to CAB against National Airlines' proposed Miami-Tampa-New Orleans coach service, slated to start around May 15. Delta says traffic on the link is not heavy enough to support coach operations. . . . Company reports $272,644 net income and a $534,443 operating profit in first-quarter 1950. March traffic broke all previous records, and April was well ahead of the same 1949 month. Passenger traffic alone was 26 percent higher in first-quarter 1950 than in the comparable period last year.

▶ **National**—Plans to include Jacksonville and West Palm Beach, Fla., as intermediate points on its New York-Miami coach service which will start this month.

▶ **Northwest**—Company has been authorized to suspend service at Green Bay and Wausau, Wis., until CAB rules on Wisconsin Central Airlines' application for extension of its feeder certificate. . . . NWA has inaugurated service to Edmonton, Canada, on its international route and to Great Falls, Mont., on its coach flights.

▶ **Pan American**—National Mediation Board indicated that a threatened strike against PAA by 3000 service and maintenance employes—members of the CIO Transport Workers Union—has been averted by a new agreement.

▶ **Panagra**—Is now using the new $35 million Ministro Pistarini Airport at Ezeiza, near Buenos Aires, for all flights to and from that city.

▶ **Pioneer**—First-quarter 1950 passenger business was up 30 percent over 1949.

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► **Robinson**—Has asked CAB for a temporary exemption authorizing service to Utica-Rome, N. Y.

► **Slick**—Reports a major boom in cargo traffic to Chicago as a result of television parts shipments from the East.

► **Swissair**—Began air coach service between Zurich and London May 1 . . . Airline has also changed its trans-Atlantic schedule with planes now leaving Idlewild at 1:30 pm (EST) instead of 11:30 am, and arriving in New York at 7:30 am instead of 9:45 am . . . Twice-weekly service is to be augmented with another arrival and departure each Friday starting May 19 . . . Officials are considering addition of either DC-6Bs or Super Connies to their overseas fleet.

► **TWA**—Expects to finish restyling the interiors of 35 Constellations at its Kansas City base by June 17. Six seats were added on domestic Connies and nine on the overseas fleet, making capacities of 57 and 49, respectively.

► **United**—Has taken delivery on the first of five new DC-6s ordered last August. . . . UAL has asked CAB to reject Western Air Lines' proposal that WAL be the only carrier permitted to operate certificated air coach service between Los Angeles and San Francisco.

CAB SCHEDULE

May 8—Oral argument on labor aspects of Western Air Lines' sale of Route 68 to United Air Lines. (Docket 2839)

May 10—Hearing in Arrow Airways enforcement proceeding. (Docket 4199)

May 15—Oral argument in South Texas service case. (Docket 3645 et al)

May 15—Hearing on CAB's investigation of New York-Miami daylight coach tariff. (Docket 4302)

May 17—Hearing on case involving American Airlines' Los Angeles-San Francisco cargo flights. Postponed from May 8. (Docket 4211)

May 18—Oral argument in CAB's investigation of Parks Air Lines' routes. (Docket 3965 et al)

June 1—Hearing on CAB's investigation of unauthorized cargo operations of Metropolitan Air Freight Depot, Inc. (Docket 4319)

June 5—Resumption of CAB's enforcement proceeding hearing involving Trans American Airways, Great Lakes Airlines, Golden Airways, Edward Ware Tabor and Sky Coach Airtravel, Inc. (Docket 4161)

June 5—Hearing on approval of Transocean Air Lines' agreements with Loftleider, h.f., and Trans-Asiatic, Ltd. (Docket 4244)

June 8—Hearing on CAB's investigation of unauthorized cargo operations of American Shoppers, Inc. (Docket 4296)

June 12—Hearing on applications of TWA and American Overseas Airlines to suspend service at Philadelphia on trans-Atlantic flights. (Docket 4228)

June 12—Oral argument on additional service to Puerto Rico. (Docket 2123 et al)

June 12—Hearing in reopened case on additional California-Nevada service. (Docket 2019 et al)

June 19—Hearing on CAB investigation of Northwest Airlines' tariff practices and uncertificated operations of Fly Freight, Inc., and Sterling Freightways. (Docket 4298)

Jan. 8, 1951—Hearing in Big Four mail rate case and CAB investigation of the carriers' economy and efficiency. (Dockets 2849 et al and 3662)

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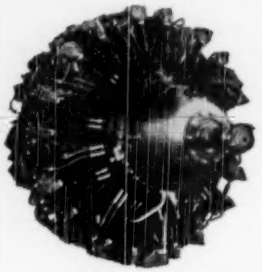

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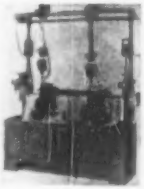

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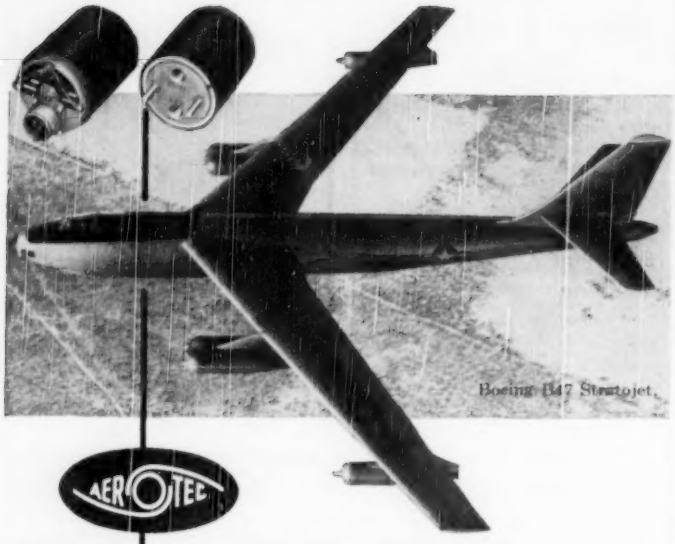

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WHAT'S NEW

New Literature

Booklet describing advantages of flash-butt welding by controlled techniques and typical product applications, including jet engine parts, is available from The American Welding & Mfg. Co., Warren, Ohio.

Bulletin covering "Report on the analysis of the current carrying capacity of insulated wire made in accordance with specification XEL-38 installed in aircraft subject to high ambient temperatures" can be obtained by writing Boston Insulated Wire & Cable Co., Boston, Mass.

Folder titled "Compound Chemicals Reference Guide in Airline Maintenance, Operations and Overhaul" consists of complete table of operations broken down into six major divisions and their detailed components, cross-referenced with the correct type of chemical material for each item of maintenance work. Write John B. Moore, manager, aviation chemicals div., Fine Organics, Inc., 211 E 19 St., N. Y. 3, N. Y.

Catalog H-33 giving information on all types of aircraft oxygen breathing equipment and for emergency smoke or fume protection is available from Scott Aviation Co., Safety Equipment division, Lancaster, N. Y.

Folder titled "Don't Be Fooled by Erroneous Cost Studies" treats assumption of different levels of efficiency, average interest error, book-value error, capitalization of book-value loss, inaccurate assumption of future requirements, incorrect use of overhead ratio, and improper interest rate. Copies can be obtained from V. W. Palen, bureau of public information, N. Y. University College of Engineering, N. Y. 53, N. Y. price 10 cents.

Manual on electrical lugs, connectors, and accessories gives technical data for use and installation, engineering information, etc. Write Ilsco Copper Tube & Products, Inc., Mariemont, Cincinnati 27, Ohio.

New Books

Book detailing basic engineering principles to enable designers to use aluminum extrusions contains over 390 illustrations, index of tabular material and itemized cross-index, 16 tables of data on chemical, mechanical and physical properties of aluminum, extrusion process data, and condensations of finishing and joining methods. Write Reynolds Metals Co., 2500 So. Third St., Louisville, Ky.

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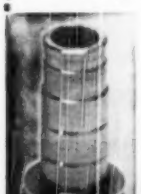

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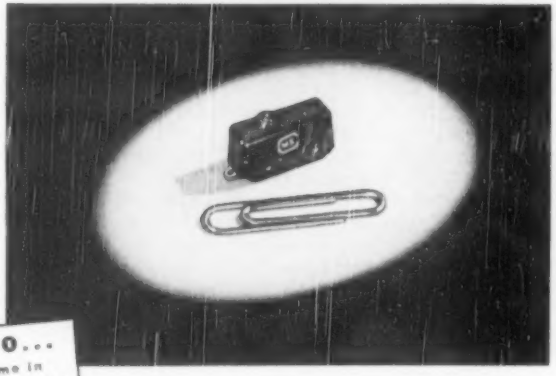

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Coaches Must Pay Off

The critics of air coach are taking an interesting new line. When the nonskeds were in their hey-day flying thousands of passengers a week, the established industry scoffed at the coach idea per se. And it snarled at us for "taking the side of the nonskeds."

All we said was that the nonskeds were serving a new market, and that it looked like a market worth trying to capture—the mass market, that is—and why didn't the scheduled airlines quit being dogs in the manger and try it themselves?

You all know what happened. They did at last get started. Now there are about 20 authorized coach flights operated by the certificated lines, serving 28 cities.

And we see dollar-wise, revenue conscious Eddie Rickenbacker eliminating all extra fares for his fastest flights and asking for still more coach service to boot. National ditto. Delta wants to remove its fare premiums on its DC-6s, too.

And only 10 days after American Airlines starts its daily DC-6 round trip coach service with 70-passenger Sixes, its vice president-sales comes out and calls the innovation "an unqualified success." The service actually ran up an 86.4 percent load factor.

So now, instead of everyone wailing that the coach idea will never work for the scheduled airlines, we note the critics have adopted grudgingly a "let's go slow" attitude, instead. That at least makes some sense. We are making progress when we concede that maybe there's something in this idea after all.

We have no bone to pick with those who want to "go slow." Just as long as we do go. But please let's don't have these retreating counselors, with their firm grasp of the obvious, keeping on insinuating that we coach-advocates have been plumping for coach services that won't pay off. And that is exactly what a few are doing.

Our hard working friend, CAB Chairman O'Connell, for example, in a recent address, concedes that "generally speaking, the coach schedules have been successful, although there have been some failures." We believe we have reported the failures. And in light of a recent editorial on "Woolworth or Tiffany?" we are interested that Mr. O'Connell admits the "Woolworth approach ... is a good approach, providing that there is any profit margin." Business, we understand, defines the Woolworth principle as a profit—not a loss—on quantity sales.

Then, not wanting to appear too optimistic, the CAB chairman quickly adds, "But if the profit margin turns out to be a loss, then either the airline loses or the government must make up the loss with subsidy payments." Really, Mr. O'Connell, that's not new. We've been all through that! We all watched the post-war airline losses with so-called "luxury" transportation—which only a piddling fraction of the country's population was able to afford.

We coach advocates squawked long and loud for CAB and the airlines to give the masses a break, offer them air coaches, continue these services if they paid off, charge higher fares where the traffic potential demands it. And then if there is too much duplication of service by too many airlines between the same points, and even a sensible minimum air coach fare won't pay off for certain carriers, maybe CAB will finally have its reason for eliminating any costly flights the public is not willing to pay for in patronage.

We agree with you, Chairman O'Connell, when you say: "What we want to know is whether or not each schedule makes economic sense. Does it pay its way? Does it attract new business or simply divert from existing first-class services? These are the acid tests which must be applied and on which the future of these experiments depends." We might argue that new business is worth more to the industry than the same sums spent on first class service by confirmed air travelers.

But we agree with those who warn against "rate reductions on an across-the-board basis." Let's go slow and keep the coach services that pay, kill those that don't. Let performance decide, but let's be careful not to introduce any new gobble-de-gook "cost-ascertainment formulas" into the works to hide actual coach profits.

Let's stop forcing the masses to crawl along in trains and buses if we could fly them to their destinations a lot quicker, at a profit to our industry, with fares close to those charged by ground competition.

We are tired—and we think most taxpayers are—of subsidizing "luxury" service, and think the farther Aviation gets away from subsidy the better off it will be—even if its airplanes do get to smelling more of bananas and babies.

New Ideas Will Pay Off

Note to smart manufacturers and designers of transport planes, Army weapons, and ground-servicing equipment:

We think you will read about the Exercise Swarmer war games in this issue of AVIATION WEEK with keen interest. The story by our own Military Editor, Ben Lee, appears elsewhere in this issue.

Ground handling of aircraft was woefully inefficient. Much Army materiel must be re-designed so it can be flown into battle areas. Much of it is too heavy. And cargo planes themselves must undergo changes to accommodate Army equipment even after ground pieces are modernized. We are quick to point out that apparently such modern loading equipment as does exist was not used in the exercises.

Added to these lessons is the obvious conclusion that the ground and air services must work together better in solving these common problems. Cooperation up to now has been insignificant.

If Operation Swarmer does nothing else than knock USAF and Army heads together on re-designing equipment, it will have been a whopping success. The results, of course, could have been forecast by anyone who is familiar with the situation, but the war games—with their excellent press coverage—have dramatized it as nothing else could have, short of a tragic war.

It looks to us as though both Army and Air Force will soon be coming to manufacturers of equipment for help and ideas. Funds will be forthcoming eventually. The smart manufacturers will already have ideas on tap, and on the drawing boards. Others not so smart will sit quietly waiting for the services to bring detailed specifications. Wonder which group will get more orders?

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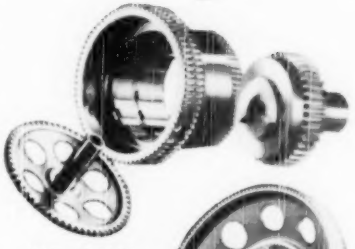

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